

INDIA

A REGIONAL GEOGRAPHY



Editor
R. L. SINGH

National Geographical Society of India

649

It is an attempt to fill in the long-felt gap in the Indian regional geography, containing first hand information. The book consists of 29 chapters grouped into 4 parts in addition to a comprehensive introductory chapter which deals with the general geographic background with significant bearing on the regionalization of India, general regional methods, previous attempts at regionalization and the purpose of the present regional scheme. India has been divided into 4 macro and 28 meso regions, each being further sub-divided into first, second and third order regions.

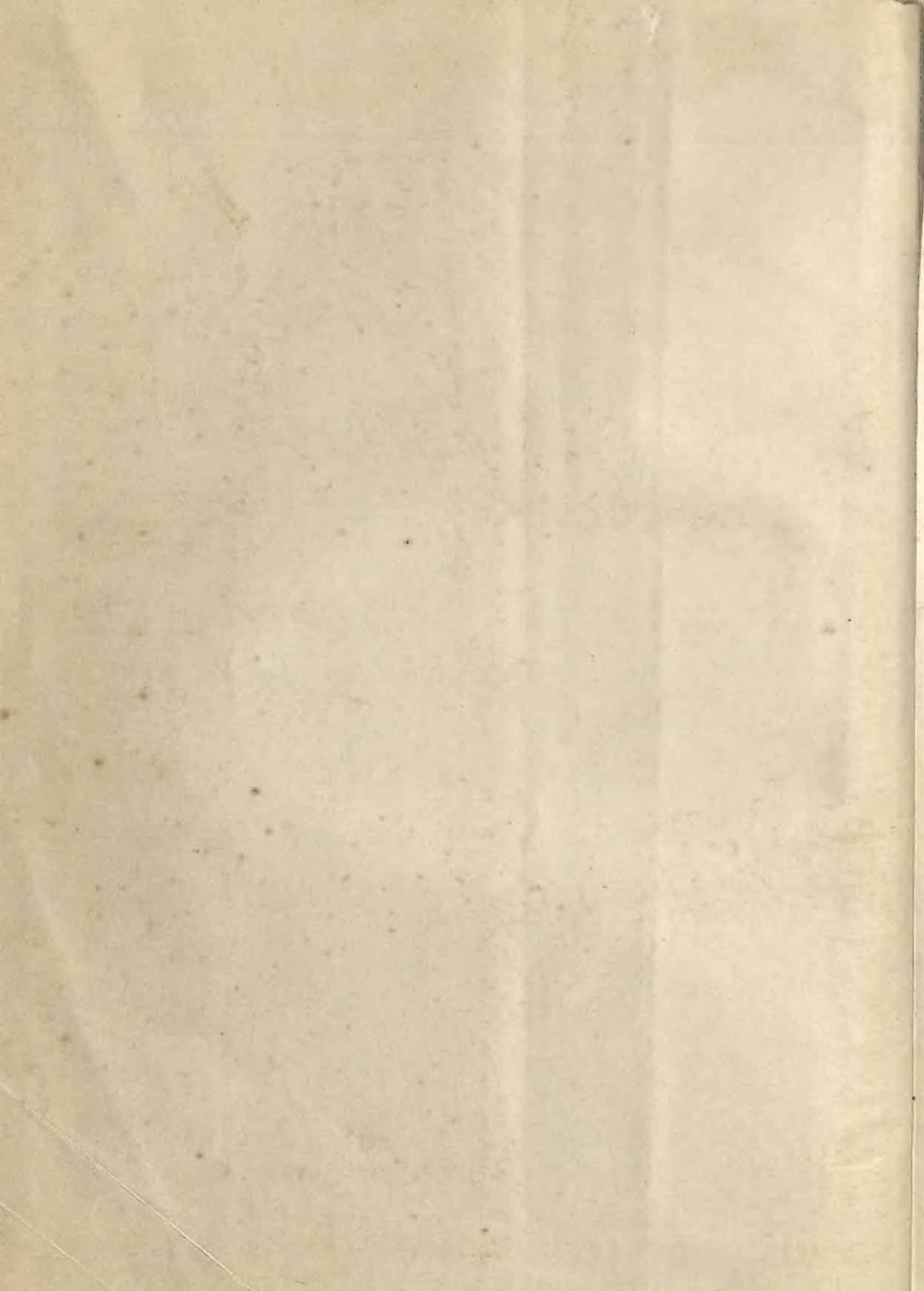
Each one of the 28 meso order regions is assigned a separate chapter. The regional personality is vividly brought out from village and primary level to urban and tertiary level, scanning the available sources coupled with field works carried out by the authors, the contributors and 28 research assistants; attempt has been made to project the personality through as much local knowledge as possible, with advantage. The role of historical, social and economic factors in the development of the regional character has also been evaluated.

Attention has also been focussed on the salient features concerning the problems and prospects of each region. As far as possible the text is illustrated adequately with over 400 maps, diagrams and photographs. It has ultimately become possible to distinguish 67 first order, 192 second order and 485 third order regions which may eventually stimulate further research work and subsequent preparation of regional monographs covering various aspects of Indian regional geography.

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A REGIONAL GEOGRAPHY



Editor

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ORIGINAL ARTICLES

THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

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1917

PREFACE

While editing 'India--Regional Studies' for the 21st International Geographical Congress (New Delhi, 1968), it was felt that a comprehensive volume on the regional geography of India could be brought out in the near future to fulfil a long-felt gap in Indian geography. Meanwhile, the decision of the National Geographical Society of India and the Department of Geography, B. H. U. to celebrate their Silver Jubilee in 1971 prompted us to associate the preparation and publication of the volume with this auspicious occasion.

A detailed plan of work was formulated with a great deal of deliberations amongst the colleagues and research workers, and cooperation of almost all institutions concerned with geographic teaching and research in the country was sought. The regional scheme from macro-to-micro level was circulated by October, 1969. The Kharagpur venue of the Indian Science Congress (1970) was utilized to explain the objective and scope of the work. By March, 1970 it was expected to complete at least a quarter of the preparation work. To our surprise, the response was rather poor and for completion of the work a major reshuffle had to be made. With the cooperation of the research assistants and colleagues (mostly local), however, it could be possible to complete the work within the target period.

In a country like India with its complex physical and cultural characteristics and powerful traditional impact where regional personality is yet to emerge in most regions in the context of modern developments, it was indeed a stupendous task to distinguish and designate regions on the hierarchical basis. The various attempts and considerations involved in regional delineations have been reviewed in the introductory chapter which also presents general geographic background of the country in the light of which the regional characteristics could be correctly visualized. It was also baffling to integrate the scale of treatment with the diverse size of the regions within their historico-physical framework. Under the circumstances, it could be possible to outline 28 meso level, 67 first order, 192 second order and as many as 485 third order regions, with indications for further lower order regions at places. There are different kinds of regions at all levels. Chotanagpur in the Peninsular Uplands, the Assam Valley in the Great Plains, the Kashmir Region in the Himalaya and Gujarat Region in the Indian Coasts and Islands are examples of the traditional types, while Dandakaranya, Tamilnadu and South Sahyadri, Purvanchal, etc. are physico-culturally integrated regions; whereas the Vindhyan-Chhatisgarh, though considerably disintegrated, would emerge as a distinct region around a 'growth pole' involving harnessing of power-potential of the region to the advantage of even the contiguous areas; regions like Chhattisgarh and Himachal or Eastern Himalaya are distinct by physical impact of the basins or the mountains.

Attempt has been made to set a pattern of treatment and coverage with a view to projecting the regional personality vividly. The historico-cultural factors influencing the regional patterning have been evaluated as much as the physical factors of relief, structure and climate etc., while the processes and patterns of resource utilization have also been analysed, highlighting their role in regional differentiation at different levels. The stage of economic development and the growth potentials have been evaluated as much as possible within our limited resources. However, from the regional analyses the picture to emerge in future is visualized. The overall objective has been to draw the attention of all concerned to the inherent strength and weakness of the regions in the totality of their geographic perspective. Particular attention has been paid to make the regions of various orders as much precise as possible by going down to the *block* or *thana* level administrative units with a view to making them serviceable as well as feasible for planning and development purposes.

While elaborating the meso-level and first order regional characteristics it could not be possible to deal, in any considerable detail, with the micro-regional characteristics, particularly due to limitations of time as also of resources. However, with the help of research and field assistants, village-level data could be processed and incorporated wherever possible, and rural as well as urban landscapes as sample studies have been delineated for most regions.

Owing to very limited response from various quarters entrusted with the work, over 60% of the work had to be penned by the editors themselves (rather a new task) in order to attain the completion within the target period. The editors are fully conscious of the failings and limitations

arising therefrom in the work. Moreover, over 600 cartographic illustrations had to be designed and processed for reproduction within the scheduled time, which was a stupendous task indeed, and the editors could not help incorporating some of the illustrations even though not being up to the mark. The editors take full responsibility for some of the errors and discrepancies which might have crept in.

It is intended to bring out a Hindi Edition of the present work within the Silver Jubilee Year (1971), while another volume, 'India Through Maps' might also see light with the materials in hand. In course of working on this volume it was felt that Regional Monographs on each of the meso level regions could also be brought out in the sequel though it would involve further detailed field work by trained geographers. It goes without saying that each of the 485 micro-regions delineated would offer necessary regional frame for detailed work on varied aspects of Indian geography.

We are sure, inspite of the aforesaid limitations, the present volume would be able to serve the students, researchers, and regional planners in particular and administrators and the public in general, by providing integrated picture of the regional personality of Bharat from Kashmir to Kanyakumari and from Dwarka to Kamrup.

In the preparation of the book, help and materials, both published and unpublished, have been drawn from diverse sources, organizations and individual workers, and to acknowledge them all individually is not possible though it would have been a pleasant task. However, the temptation to express gratitude to several of them cannot be resisted such as to the National Atlas Organization, Survey of India, Geological Survey of India, Oil and Natural Gas Commission, Central Water and Power Commission, Registrar General and Census Superintendents, National Council of Applied Economic Research, Directorates of Town and Country Planning, of Information and Statistics, etc., Planning Organizations up to Block level, the Publication Divisions and several such government, semi-government and specialised institutions including university centres of research, etc. We are particularly grateful to a large number of researchers for providing access to their unpublished Ph. D. and M.A./M.Sc. dissertations and Village and Town Survey Reports, especially from such centres as B. H. U., Gauhati, Patna, Calcutta, Poona, Rajasthan, Udaipur, Meerut, Aligarh, Jodhpur, Sagar, Punjab, etc. We will be failing in our duty if we do not express our gratitude to Dr. K. L. Srimali, the Vice-Chancellor, Banaras Hindu University, for providing generous financial assistance towards the preparation as well as publication of the work. Special mention also need be made of the assistance received by our research assistants in the field from the district and block-level officers, particularly in Andhra Pradesh, Dandakaranya and Tamilnadu. Acknowledgement is also due to the P. R. O., Rajasthan State Government, for supplying required photographs. Thanks are also due to a huge body of our cartographic staff and research scholars, without whose help processing of the illustrations could not have been possible. To mention some of them will be quite pertinent such as S. Prasad, O. P. Srivastava, A. K. Karanjai, Om Prakash, Umesh Kumar Singh, Tara Devi Singh, Kumkum Majumdar, Shree Ram Rai, B. P. Gupta, P. R. Sharma and the research assistants. General acknowledgement of the help rendered by the colleagues will not be out of place. We are particularly grateful to R. N. Mathur, N. Prasad, B. Dube, K. K. Dube, Onkar Singh and R. P. Singh for doing the painstaking work of proof-reading; to V. R. Singh for arranging the photographic illustrations; to Dina Nath Singh, K. K. Lal and Bajrang Bahadur Singh for preparing index and glossary; to the entire office staff, Bali Ram Singh, Bachchan Singh, Uma Nath Singh, Natendra Singh, Ram Nagina Singh, Banwari Ram Yadava, Hari Bansh Singh, Chhabi Nath and to Nathu Ram for typing etc., and to the Annapurna and Saraswati Block Works, Varanasi for prompt work in the reproduction of illustrations. Last but not the least important are the services rendered by the Bhargava Bhushan Press, and we are particularly grateful to Surendra Bhargava, the proprietor, for his extra-keen interest in bringing out this publication in the shortest possible time.

All constructive criticisms and suggestions will be gratefully acknowledged and looked into and attempt would be made to incorporate the materials in the next edition to follow soon.

Varanasi,

Jan. 2, 1971.

R. L. Singh

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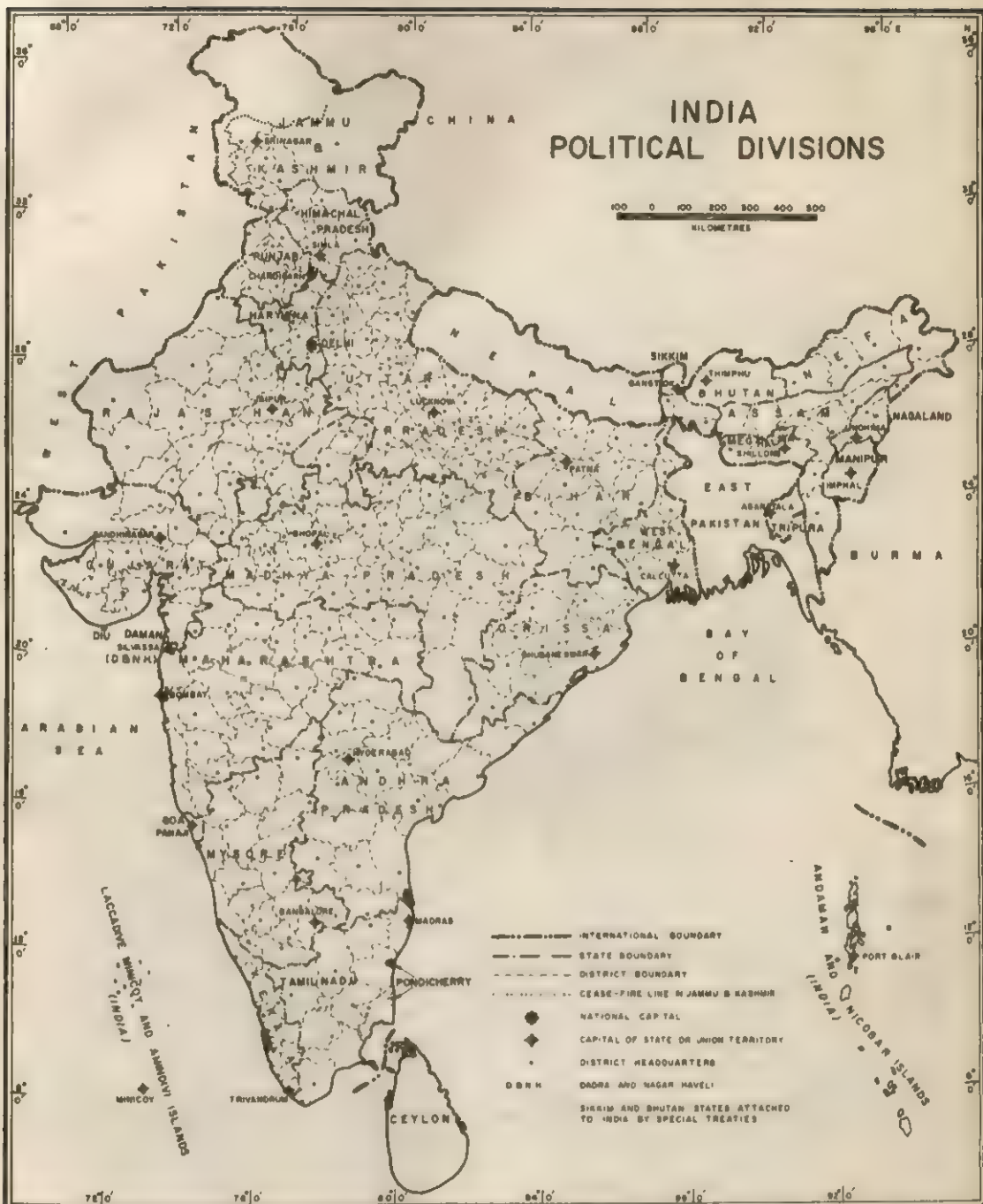


FIG 11

India : As a Geographical Unit

India, that is Bharat ($8^{\circ}4' \text{ N}$ — $37^{\circ}6' \text{ N}$ and $68^{\circ}7' \text{ E}$ — $97^{\circ}25' \text{ E}$), * the land of the venerable Ganga and revered as *Bharat Mata*, embraces major part of the South Asian realm. Girdled by the young-folded mountain chain on its NW, N and NE and washed by the foundered basin of the Indian Ocean and its two main arms, the Arabian sea and the Bay of Bengal on the SW, S and SE, it has since historic times the privilege of being a well-defined geographical and geopolitical unit. The so-called invincible Himalayan wall is no longer an impenetrable rampart in view of the modern developments of war strategy including nuclear weapons; its geographic significance, however, remains intact. As a geographical unit it can hardly afford to exclude Pakistan, emerging as it does out of the political foundering of the so-called sub-continent. The use of the term sub-continent for India is a misnomer and a legacy of the British rule; this term has never been used for vaster and more diverse geographical units like China and the Soviet Union.

The word 'India' traces its origin in the Greek literature meaning the land of 'Indoi', the people living near the Indos (latin Indus)¹. Its Persian and Avestan equivalent refers to Hindu, cognate with 'Sindhu', the river of ancient Sanskrit texts applied to the province of Acheamenid Empire adjacent to the Indus and meaning "the land of great river". In broader sense, it included the area lying to the east of the Sulaiman-Kirthar ranges and south of the Himalaya, a fact which held true till the independence of the country (August 15, 1947) when it was separated into two nations, i.e., India and Pakistan. This has led some to replace the

term Indian sub-continent by South Asia including, apart from the Indo-Pak realm, Nepal, Bhutan, Ceylon and sometimes even Afghanistan. Though Pakistan is a political reality, East Pakistan appears to be an enclave while West Pakistan an appendage within the physiographic frame of South Asia.

The name 'Bharat' bears the testimony of geographical and historical significance. The concept of Bharat was developed after the name of *Bharat*, the sovereign king, who visualised the fundamental unity of the country. The *Rigveda*² first mentions him as a leader of powerful Aryan Tribe; while the *Aitareya Brahmana*³ refers to his coronation ceremony, subsequent conquests and *Aswamedha* sacrifice. The *Bhagavata Purana* calls him as *Adhirat* and *Samrat* i.e. King of Kings, who accelerated the pace and process of Aryanisation of the then people (the Kiratas, the Paundras and others) alien to the Aryan culture. Bharat is, therefore, another name for Aryanised India where Aryan culture developed and attained its fruition. The same etymology connotes that *Bharati Santatib* (descendants of Bharat) reside in Bharat.

The Republic of India, with a land frontier of 15,200 km and a coastline of 5,700 km, is still a geographical reality though exhibiting contrasting features. With its N-S and E-W extent of 3,200 km and 3,000 km respectively and with an areal coverage of about 3,267,500 km², it ranks seventh amongst the countries of the world and holds second and third position respectively, regarding population (439 million, 1961) and cultivated land (1,362,440 km²), being surpassed by China in the former case and the U.S.S.R. and the U.S.A. in the latter. It may, however, be noted that none among the larger nations is comparable to India in terms of the percentage of arable land (about 42%) to the total area.

* The southernmost tip of the Nicobars touches the parallel of $6^{\circ} 45' \text{ N}$.

India is the largest democracy in the world with a Parliamentary form of government. It constitutes seventeen states, varying in size and population (Nagaland 0.4 million, Uttar Pradesh 74 million, 1961), ten Union territories, NEFA—a Union territory but governed through the Governor of Assam, Meghalaya—a sub-State within Assam, Sikkim, an Indian protectorate, and Bhutan, under special treaty with India (Fig. 1.1).

Bharat includes simultaneously the historic territorial concepts in terms of Dravidian and Aryan cultures which, though diverse in origin, could fuse together with the Hindu culture in its geographical realm since 50-odd centuries. The cultural and national integration is reflected in the location of the four *Dharmas* (Holy places)—Rameshwaram in the South, Badri-Kedar in the North, Puri in the East and Dwarka in the West, these being the cultural centres in the four cardinal directions within the dimensions of the country. The visit to these centres by every Indian was considered to be significant in one's life even in remote times when inaccessibility threatened movement. Varanasi served as a crucible for fusion and crystallisation of the diverse cultures of India.

The well-established and crystallised Indian culture and thoughts expanded their horizon beyond its precincts, primarily through Buddhism which, like Jainism, was a distinct stream of reformatory thoughts within the mainstream of the 'Hindu Way of Life.'

The high Himalaya impart climatic distinctiveness to the country, typified by the monsoonal character, an attribute not possessed by any single landmass of its size. In addition, this synonym of the 'abode of snow' also serves as the perennial source of water supply to the streams which in turn are used for some of the world's biggest irrigation and power schemes. Some of the gaps, particularly in the NW, permitted the influx of invaders and streams of migrants since ancient times, a factor which caused political turmoil on the one hand and cultural enrichment and diversity on the other. The over-sea and coastal movements of the people, for trade in particular, have taken place even prior to the West European negotiations, and the Indian people too fanned out from the Persian Gulf region

to the SE Asian realm. Though culturally united since early times, political turmoils could sweep the country from time to time with occasional spans of vast organised empires like that of the great Ashoka and Akbar. At times, the development of small protectorates, asserting themselves occasionally, was largely induced by the conditions of terrain and physical barriers, expanses of large forests like Dandakaranya, and difficulty of movement. These factors have also been responsible for nurturing independent isolates in extreme marginal areas, as the South and the North-east. Far in the South, away from the core of the Indian nation, the western traders like the French and the English, successfully established their trading out-posts, the latter being supported by naval and military strongholds strategically manoeuvred through the Clivian way. Herefrom they penetrated slowly to the North and North-west through the great openings of the valleys.

India is, thus, a country of unity in diversity exhibiting manifold physical, cultural and economic contrasts which are the woof and warf of the national panorama. It enfolds within its bounds the loftiest of the mountains representing the youngest mountain-building epoch in the geological history of the earth and a most subdued relief in the Peninsula, showing one of the earliest geological structures. Hemmed in between the two, lies one of the greatest alluvial plains of the world. Although climatically a typical monsoonal realm, with all its rhythmic characteristics, the country exhibits a wide range of climatic variation from the dry continental conditions to the humid littorals. Purely tribal, agricultural and industrial-commercial economies lie in juxtaposition to one another. The development of steel belt covering parts of Bihar, West Bengal, Orissa and Madhya Pradesh, for instance, is a recent superimposition over the tribal economy of the area. Likewise, in the Karnataka uplands the Central Industrial estates of HAL, ITI, HMT., etc. are isolates in the agrarian landscape. So also, on a micro scale, the Renukut complex is an industrial oasis in the tribal economy of the Son-Par tract (U. P.). From the vast, rather, uninhabited tracts in the Laddakh and Thar to some of the world's highest

densities of river valleys, deltas and the littorals are visible within the country's landscape.

Even with all these natural contrasts and changing socio-economic and political patterns, India projects itself as a single territorial unit on a national scale. Here one can hardly ignore the unifying role of the Great Plains which constitute a link between two diverse structural units which together have contributed to its making. So signifying is the role of the Ganga that rightly it is regarded as the 'Mother Ganga', the pivot of our culture, providing perennial vitality to the society and acting as the strongest bond. The cultural heritage of the Ganga has been all-pervasive. Its dominance is still reflected in the traditional veneration attached to several rivers within different regions of the country, such as the Kaveri and the Godavari, the Ganga of the south, thus leading to "Gangaisation" of the Indian culture. This cultural unity shall continue to prevail against all odds. So strong have been the ties of this 'unity' that even the great physical scarps could not disrupt the nation, while barriers in miniature have caused Balkanisation of Europe.

Although the complex multi-lingual frame of India has been played upon by the regionalists for political ends, the language has seldom proved to be a barrier in our social and cultural intercourse. The *Ramayana* and *Mahabharata* still provide themes even for tribal dances and music. Hinduism has naturally been a way of life rather than a monolithic cult. Varanasi in the heart of the *Aryavarta* has served as the point of cultural assimilation and diffusion. The sages and prophets like the Buddha, Kabir, Tulsi, Shankaracharya and Ramanujam have all paid their homage to Varanasi.

Forests, plentiful in the past, have been the abode of the forest culture, which was never antagonistic to those of the plains or hills. It also provided shelter and solitude to great thinkers and meditators.

Centuries of Muslim and British rule failed to disrupt our cultural ties. The British rule, as a world power, no doubt, curbed our industrial developments and smashed our rural polity, but was shaken by a small movement, the Mahatma's *Dandi march* symbolic of our national sentiment.

The edifice of political unity will ever derive strength from the cultural base.

The Physical Setting

Geology

Geologically the country represents a monumental assemblage of land pieces, varying in age from pre-Cambrian to the Recent. The Peninsular massif is the core, around and upon which different acts of geological drama were staged and all have left their imprints in some form or the other. This massif, a part of the super-continent, "Gondwanaland", till its rupture and drifting sometimes in the mid-Mesozoic era (about 200 million years ago), lay somewhere near the South Pole alongwith Australia, South Africa and South America, as has been established by the similarities observed in the Palaeontological, Palaeobotanical, Palaeomagnetic and glaciological studies of these areas, at present lying distantly apart. The series of Islands in the Arabian sea are the relics of the former links. The flat summits, entrenched valleys, the dykes, folds and faults, all speak of the alternating periods of disturbances and inactivities responsible for the present configuration of the country. Broadly speaking, the major geological phases responsible for the making of India can be enumerated thus :

1. The first phase is marked by the cooling and solidification of the upper crust of the earth surface in the pre-Cambrian era (prior to 600 million years) represented by the exposure of the Archaean gneisses and granites especially on the Peninsula. Minor igneous activities, subsequent metamorphism and crumplings alongwith the folding of the Aravalli Mountains represent the main activities.

2. The levelling of the undulations and crushing and crumpling of the sediments of the Dharwarian group (Bijawars) mark the second phase. The igneous activities and intrusions imparted it the character of mixed sedimentaries.

3. The calcareous and arenaceous deposits corresponding to humid and semi-arid climatic regimes in the Cuddapah and Vindhyan basins bordering or lying within the existing landmass

and its uplift during the Cambrian (500 million years ago) mark the main sequence of events in this period. These formations have, by and large, still preserved their horizontal stratification. Cuddapahs are certainly older (pre-Cambrian and Cambrian) as they underlie the Vindhya, but the controversy regarding the chronology of upheaval of Vindhya is yet to be resolved. The imprints of the later movements exist only in the form of faults, joints and minor folds at places.

4. The Permo-Carboniferous glaciation from a southerly source and extensive glacio-fluvial deposition in the depressions and subsequent sag-faulting where these deposits, designated as the Gondwanas, are preserved, along with the transgression of the Permian (270 million years ago), exhibit the major activities of this phase.

5. This phase can be recognised as world's major event in the form of fracturing and drift of the continental mass of 'Gondwanaland' (mid-Mesozoic, 200 million years ago). To this drift probably owes the subsequent uplift of the Vindhya, the circumferential zone and the northern peripheral sediments in the Himalayan Sea.

6. Close of the Mesozoic (70 million years ago) witnessed one of the greatest volcanic eruptions, the Deccan Lava Flows, covering more than 500,000 km² area followed by the first phase of the Tertiary orogeny—the Karakoram phase, by coming closer of the two land-masses, the Angaland in the north and the Peninsular India in the south, under the oscillatory movement of the continental masses to-and-from the Pole. The movements responsible for the three parallel folds of the Himalaya Proper took place subsequently during Oligocene (25-40 million years ago), mid-Miocene (14 million years ago) and Post-Pliocene (750 thousand years ago). Contemporaneous had been the formation and alluviation of the Tethys geosyncline or the Indo-Ganga trough and the tectonic troughs in the Himalaya, especially the Kashmir valley. Alluvial and glaciofluvial deposits (Pliocene-Holocene), filled up these troughs. Considerable drainage derangements must have taken place before the present system could have been established. Mention must be made of the Rajmahal-Garo gap or the Malda Gap (Pleistocene)

as also of the later upheaval in the Indo-Ganga divide which dismembered and diverted the whole of the drainage of North India, east of the Aravalli, to the Bay of Bengal, originally going to the NW through the Indo-Brahm (Pascoe)¹ or Siwalik (Pilgrim)² river. Other major derangements may be noted such as the Narmada-Tapti troughs and the foundering of the West Coast.

The buried extent of the Peninsular massif has imparted semicircular trend to the young folded mountains with syntaxial bends around Salt range in the NW and Namcha Barwa in the NE. The channel of the Ganga is also in sympathy with the shape of the Peninsular foreland and has perhaps reached its limit of southward shift, washing at places the old bed rocks.

The country, according to lithological, sedimentational and tectonic history, can safely be divided into three provinces, i.e. 1. The Peninsular Block, 2. The young-folded Mountain Belt and 3. The Indo-Ganga Trough. The Peninsular Block consists of the outcrops of older rock groups, such as the Archaean metamorphics and granites covering major part of the Peninsula, the Dharwarian mixed sedimentaries with igneous intrusions overlying the Archaean and exposed on the Karnataka Plateau and Baghelkhand. The Dharwar system is by far the most important mineralised formation containing iron-ore, manganese, mica, gold, etc. Overlying the Dharwarians are the Cuddapah sedimentaries acquiring the name from the exposure at the place in Rayalseema and are also exposed in the upper Mahanadi Basin. The sedimentary Vindhyan and the glaciofluvial Gondwana rocks are exposed along the Peninsular foreland north of the Son-Narmada trough and in the elongated fault basins of the Permian Period (the Godavari, Mahanadi and Damodar basins) respectively. The only other significant layer is of the Lava covering about one-sixth of the country's area and burying much of the older formations and the surface forms in the states of Maharashtra, Gujarat, Madhya Pradesh, and the adjoining Andhra and Karnataka Plateaus. The only detached exposure is that of Tamilnadu upland. In addition, there are traces of patchy overlappings of the loose sediments in the broad valleys

and along the coasts, especially the eastern coast. It may be added that this so-called stable block cannot be regarded as an earthquake-free zone in view of the recent Koyana earthquake (1967).

The Himalaya are the representative of the recentmost epoch in the orogenic history of the earth causing the uplift of Archaean to Mesozoic accumulations in the geosyncline (about 25–60 million years ago). The intermittent but intense impulses resulting from the oscillatory movements of the continental masses from and towards the Pole compressed the sediments in parallel folds starting from the Thorung stage^a to the Siwaliks. The folds are asymmetrical and testify the intensity of the compressional impulses by presenting very often the over-folds and thrust-folds resulting in Alpine-type nappe structures.

The Indo-Ganga trough (Eocene-Oligocene) owes its filling up to the drainage, Peninsular as well as the Himalayan. The thickness of the Recent alluvium overlying the Vindhyan or the Gondwanas, according to former estimates, is 4570 m, but recently it has been estimated at the maximum of 1980 m based on gravity anomalies though at places it may be below 1000 m. These sediments, derived from the rocks of different ages, have yet to undergo compaction.

Seismological studies delineate the Himalayan zone including Assam as highly sensitive, the Great Plain slightly less but the Peninsular Uplands as the least susceptible to earthquake and vulcanicity (Fig. 1.2 inset). The Assam-Bengal region has recorded about 34% of destructive earthquakes, followed by NW India (28%) and Outer Himalaya-Siwaliks (about 19%).

Ground Water

This monsoon land has to look for some water resources other than the rainfall and surface water. The 110 cm average annual rainfall provides the country with about 3,000 million acre feet of water, out of which only one-tenth is used in the ground water recharge and that too distributed quite unevenly, depending on the terrain conditions, lithology, temperature, permeability, etc. Its presence almost everywhere, though having varied depths, varying quality and quantity, blesses it with distinct advantages over the surface water.

The varied climatic, geomorphic, geological and hydrological conditions have helped the delineation of the country into 8 ground water provinces. (Fig. 1.4 inset).

1. Pre-Cambrian Crystalline Province—Occupying about half the area of the country comprising greater parts of Tamilnadu, Karnataka, Andhra, Maharashtra, Dandakaranya, Bundelkhand and Aravallis, extends discontinuously from the Cape Comorin to the NW in Ganganagar district. The ground water occurs in the weathered parts of the pre-Cambrian granite, gneiss, metamorphics etc. within 80 m from the surface. Quartzites and marbles are poorest in water resource.

2. Pre-Cambrian Sedimentary Province—It is patchy, confined to the Cuddapah and Vindhyan Basins of sandstone, conglomerate, limestone and slate. Well-compacted and non-porous sedimentary strata are least favourable for groundwater resource.

3. Gondwana Sedimentary Province—Isolated basins of the Barakar and the Godavari, surrounded by crystalline rocks, have good aquifers in sandstone, but poor in shales and coal. The wells often show good yields.

4. Deccan Trap Province—Occupied by somewhat 1200 m thick, non-porous and impermeable Basalt layers, constitutes a poor ground water province. The only aquifers preserved are in the fractures where secondary porosity develops in the weathered *moorums*, at times in the intertrappean beds sandwiched between two impermeable strata as also in the vesicles and the amygdalae.

5. Cenozoic Sedimentary Province—The Andhra, Tamilnadu, Kerala and Gujarat coasts of Tertiary sandstone and slates are good aquifers.

6. Cenozoic Fault Basin—The rift zone of the Narmada, the Purna and the Tapi provides good resource of ground water in their 80-160 m thick alluvial cover of sand, silt and clay.

7. Ganga-Brahmaputra Alluvial Province—By and large, this forms the richest ground water province of the country. The bhabar, tarai and the axial belts are well defined. The streams disappearing in the unsorted materials of the bhabar zone seep out in the tarai belt. Moreover, the ground water table is also high.

8. **Himalayan Province**—This complex structural and geographic unit is not very significant with respect to ground water resource. Local springs are common but wells are a rare feature.

Physiography

The face of the country is as complex as its making. The high altitude but younger landscape of the Himalaya presents the snow-clad peaks, large valley-glaciers, deep gorges, roaring water falls alongwith dense forest-cover standing in utter contrast to the monotonous alluvial expanse of the Great Plains or the subdued multicyclic features of the age-long chiselled Peninsula where flat-topped summits, residual ranges and broad valleys almost reaching their base-levels, do catch the eye of a casual observer. Sheltered broad valley of Kashmir through which the Jhelum meanders is no doubt an exception to the general Himalayan landscape. Numerous lakes such as Dal, Wular, Nainital, Manipur etc., represent the effect of tectonics in the form of landslides or fractures. The physical landscape of the Great Plains is characterised by the wide and open valleys of the Indus and the Ganga—Brahmaputra systems; the rivers flow sluggishly throughout the year except in the rainy season when they present vast stretches of water. The meanders, changing river courses and oxbow-lakes mark the landscape of the alluvial plains. The Rajasthan plain including the Marusthali presents a picture of contrast with vast sandy expanses and ephemeral streams failing to reach the sea. The Peninsular India is rimmed by ranges on the sides which, except the Sahyadri, are often cut through by the streams giving them access to the Great Plains in the north and the Bay of Bengal in the east. The narrow coastal strip in the west and a relatively wider coastal plain in the east are marked features on the respective margins of the Peninsular Uplands. The backwaters on the west coast and the sandy and deltaic plains on the east are distinctive landscape features. Advance of the east coast plain into the Bay of Bengal is testified by the formation of coastal lakes, such as the Chilka, Pulicat, Colleru etc., a feature hardly observed along the west coast. The two groups of islands i.e. the Laccadive, Amindivi, Minicoy etc., and the Andaman-

Nicobar groups have different origins and consequently distinctive physical landscapes. The former represents in part the remnants of the Peninsular extent which probably faulted along the west coast, and partly they are corals, while the latter are the continuance of the Tertiary Mountain chain of the Himalaya through the Patkai, Arakan-yoma, etc. which further extend to Sumatra onwards. Even the Palk strait appears to present a subsidence separating Ceylon from the Indian Peninsula.

Physiographic Divisions : Evidently it is too facile to look for physiographic homogeneity in a country where complex land-building forces and erosional processes have been at work since geologic past. An analytical approach may, however, guide us to distinguish four macro regions based on stratigraphic and tectonic history and relief alongwith the erosional processes as follows : 1. The Northern Mountains, 2. The Great Plains, 3. The Peninsular Uplands, 4. The Indian Coasts and Islands. (Fig. 1.3 inset)

The Northern Mountains : The region extends all along the northern border of the country, from the eastern border of West Pakistan to the frontiers of Burma, for about 2500 km. with an average width of about 240 km; occupied by the Himalayan ranges and its offshoots, it covers an area of about 5,00,000 km². Three major fold axes represent the Himadri (Greater Himalaya), Himanchal (Lesser Himalaya) and the Siwaliks (Outer Himalaya) extending almost uninterrupted throughout its length. Mighty but older streams like the Indus, the Sutlej, the Kali, the Kosi and the Brahmaputra have cut through steep gorges to escape into the Great Plains and have established their antecedence. The troughs intervening the ranges are occupied by the longitudinal valleys of the streams in their upper reaches. The main unifying factor is the parallelism of the three axes extending east-west.

Himadri, the asymmetrical and the northernmost range of the Himalaya owes its scenic beauty to glaciers and lofty snowy peaks. This range has a granitic core, flanked by metamorphosed sediments. It has the credit of having the world's 14 highest peaks ranging between the Jano (7710 m) and the Everest (8848 m).

The Himanchal forms the central chain composed mainly of highly compressed and altered rocks varying from Algonkian or pre-Cambrian to Eocene in age. In general, the alternating ranges and valleys acquire an elevation of about 5000 m and 1000 m respectively. Its asymmetrical structures at places provide it a more or less hogback look. It differs from the Himadri in its more regular and lower elevation.

The Siwaliks represent the outermost range of the system with roughly a hogback appearance a steeply sloping southern and a gently sloping northern face. These newer and river-borne deposits derived from the rising Himalaya represent the most recent phase of the Himalayan orogeny i.e., from Middle Miocene to the Lower Pleistocene. The range, bordered on the north by flat-floored structural-longitudinal or erosional valleys called the *Duns* is characterised by fault scarps, anticlinal valleys and synclinal ranges.

Apart from these longitudinal sub-divisions, the Himalaya exhibit regional characteristics and as such, the following regions have been identified :—

- A. Western Himalaya— 1. Kashmir Himalaya.
2. Himachal Himalaya.
- B. Central Himalaya— 3. U. P. Himalaya.
4. Nepal Himalaya.
- C. Eastern Himalaya— 5. Darjeeling-Bhutan-Assam Himalaya.
6. Purvachal.

The Great Plains : This aggradational plain covers about 700,000 km² of surface area with the Ganga and the Brahmaputra forming the main drainage axes in the major portion. The thickness in the alluvial sediments varies considerably with its maximum in the Ganga Plain. The variation in thickness largely depends on the alluvial-morphological processes. The cones of the Kosi in the north and the Son in the south exhibit greater alluvial thickness while the intra-cone areas have relatively shallower deposits.⁷ The physiographic scenery varies from extremely arid and semi-arid landscape of the Rajasthan Plain to the humid and per-humid landscape of the delta and the Assam valley in the east. The Delhi ridge is a subdued extension of the Aravallis. Topographic unifor-

mity, except in the arid western Rajasthan, is a common feature throughout, though the nature of the materials brought down by the rivers varies significantly resulting in the local geomorphic variations. The Brahmaputra and the Ghaghara carry more sand than silt and have formed long levees and have also raised their beds. Even the partial washing away of these levees during high floods submerges the extensive lowlying plains causing immense damage to life and property. With an average elevation of about 150 m, ranging from almost nothing (Bengal Delta) to nearly 300 m (Punjab and Upper Ganga Plains) near the foot-hills, the area is characterised by extremely low gradients.

Along the northern margin of the plain lie two narrow but distinct strips—the Bhabar and the Tarai. The Bhabar (a piedmont plain : 10–15 km wide) is composed of unassorted debris from the Himalaya. The surface streams disappear in this zone of boulders and sands. Immediately below the Bhabar is the 15–30 km wide, relatively low-lying, Tarai region characterised by finer sediments, natural forest cover, emergent and ill-defined water channels, low gradients and high water table (ranging from a few metres to about 5 m below the ground) resulting in swamps and marshes.

The *Gangadob* (i. e. the Ganga alluvium) is distinguishable into two types i.e. the *Khadar*, the strip covered with recent alluvium and liable to frequent inundation and siltation, and the *Bhangar* comprising older alluvium seldom liable to inundation. Changing river courses in the areas of frequent over-floodings present interesting geomorphic processes in the plains. The southern margin of the plains, being in contact with the edge of the southern uplands, is often encroached by the projections of the Peninsular mass, sometimes up to the bank of the Ganga. Some of these projections have served as defence points like that at Chunar, which is crowned with a strong ancient fort.

The Peninsular Uplands : This morphologically polygenetic and complex, relatively stable landmass extends from the southern margin of the Great Plains upto the Coastal-margins of the country and covers an area of 1.6 million km². It pre-

sents a natural landscape of detached hills, summit plains, entrenched narrow as well as aggradational wide valleys, series of plateaus, Peneplains and residual blocks. One of the major physiographic elements the SW—NE Aravalli hills, is a relict of the world's oldest fold mountains. Considerably dissected and almost detached by the Banas and the Luni in the central part, it spreads fan-like in the north sending projections up to Alwar and adjoining parts and into the Udaipur region in the south which has the highest elevation at Mt. Abu (above 1722 m). The Vindhya-Satpura alignment, owing its steep scarp and range-like character, to the Narmada trough extends East-West from the Sahyadri in the west to the Maikal in the east. Most of the Satpura-Vindhyan region is overlain by the Deccan Trap in the west, with a general horizontal disposition; the Vindhyas show a somewhat folded structure, particularly in the western section. The gentle gradient of the Vindhyas to the north and the steep step-like face overlooking the trough to the south is another distinguishing feature, while the Satpuras possess steep gradients towards the Narmada valley in the north and Tapi (Tapi) valley in the south. Average elevation rises to about 300 m with occasional detached summits rising to over 1000 m (Pachmarhi, Amarkantak). Hemmed in between the Aravallis and the Vindhyas is the triangular, dissected sedimentary surface of the Vindhyan Basin with the imprints of criss cross faults and joints. The Vindhyan range, by and large, marks the watershed between rivers draining into the Great Plains and the other streams flowing towards the south or west. The exception to it is the Son River, an accidental consequent stream.

The Sahyadri was probably a central water-divide of an older extensive landmass. With its North-South trend it serves even today as a divide between the Bay and the Arabian sea drainage. The Thalghat, Bhorphat and the Palghat are three major gaps in this alignment which since early times have served as a negotiating link between the coastal lands and the rugged plateau country. With steep wall-like appearance overlooking the west coast, they send out projections (Balaghat, Mahadeo ranges etc.) to the eastern plateau country, with relatively minor breaks in slope. Its maximum

elevation is obtained at and south of its junction with the Eastern ghats in the Nilgiri Knot (2636 m) and Anaimalai-Palni hills (2695 m) respectively.

On the eastern margin of the Peninsular Uplands lie much more discontinuous but similar ranges, from Mayurbhanj (Orissa) to the charnockite hills of the Nilgiris. Almost all the major streams like the Godavari, the Krishna, the Kaveri, taking their rise from the Westernghats or the Sahyadri, have cut extensively through the Eastern Ghats to escape into the Bay of Bengal.

Incompassed between these ranges are numerous gorges, water falls, wide alluvial valleys (Wardha-Wainganga plain) and structural-cum-erosional basins (Chhattisgarh and Cuddapah); insignificant areally but of greater economic importance are the Gondwana troughs or basins containing as they do over 98% of coal resources of the country.

To sum up "the story of its (Peninsular) landscape consists of several cycles of denudation, sedimentation and igneous activities in harmony with orogeny, epeirogeny and cymatogeny, effusion, metamorphism of deep-seated rocks, tearing, eustatism and widespread resurrection."¹⁰ As many as nine cycles (Delhi, Satpura, Eastern Ghats, Dharwar, Cuddapah-Vindhyan, late Cambrian, Gondwana, Post-Gondwana and Cainozoic) have operated either completely or in interrupted form. As to the interruption or major tectonic events up to the Cuddapah-Vindhyan cycles, nothing can be said with certainty because the landscape is much obliterated under the complex interactions of tectonics and the erosional activities. Probable major episodes intervening the cycles can be mentioned here. The Post-Vindhyan glaciation as a climatic accident has been the major event to interrupt the Cuddapah-Vindhyan cycle and to set the stage for the late Cambrian cycle which was intercepted by the late Carboniferous glaciation. The wandering of the Peninsular mass intervened the Gondwana cycle and the post-Gondwana landscape began to emerge out till the Cretaceous-Eocene lava emission cut it short.

Indian Coasts and Islands : The Indian coasts vary widely in their structural and surface characteristics. The West Coast is much narrower

except around the gulf of Cambay and the gulf of Kutch where partly due to sedimentation and partly on account of the isostatic adjustments the plains are wider enough. The Girnar Hills, the volcanic cones, appear to be an extension of the older landmass probably separated during foundering of the west coast. The two gulfs might have been linked together. The silting of the link would have given rise to the Gujarat Plains. The tilting left no scope for depositional action of the rivers on the west coast and it still retains its narrow extent throughout its length south of Gujarat to the Cape Comorin. It is only in the extreme south that they are somewhat wider along the south Sahyadri. The backwaters are the characteristic features of this coast. The East Coast Plains, in contrast are broader, associated with depositional activities of the rivers partly owing to the change in their base-levels. Extensive deltas of the Mahanadi, the Godavari, the Krishna, the Kaveri etc., are characteristic features of this coast. The progression of the deltaic plains into the sea is still continuing. Even Tertiary gravels and sands are to be observed in this region. Physiographically, the coasts can be sub-divided into : 1. Gujarat Coast, 2. West Coast, 3. East Coast.

The two groups of Islands i.e. the Arabian Sea Islands and the Bay Islands differ significantly in origin and physical characteristics. The Arabian Sea Islands (Laccadive, Amindivi, Minicoy etc., numbering 25) are the foundered remnants of the old land-mass and subsequent coral formations. The basin separating the group from the main landmass is less than 3000 m. deep.

Extending for about 590 km. of sea length and with maximum width of about 58 km. in a crescentic shape lie the Bay Islands only about 220 km away from the nearest point on the main landmass. They represent surfaces of the Tertiary fold axis, rising as high as 750 m. (Saddle peak) above the sea level. The channel separating it from the main landmass (Burma) is less than 500 m deep. The groups of Islands (222) are separated from one another by narrow creeks. The deep indentations of the coastline provide favourable base for safe harbours. The North Andaman Islands are

physically characterised by a central range and sheltered narrow valleys. Middle and southern groups have relatively wider flat surfaces in the middle, flanked by the Ghats, similar to the Peninsular Uplands, on the east and west, but contrary to the latter, the eastern ranges are higher. In general, the western coasts are surrounded by the corals about 32 km away from the shore. The Little Andaman is almost flat except the northern hilly tract.

The Nicobars, forming the summit of the submarine mountain range, are hilly (rising to about 700 m.) in character and irregular in form. The surface has been highly cut up by small streams originating from the hills. The depressions are filled up to form alluvial flats. The belt of sea sand and corals, varying from a few metres to about 2 km., forms the outer fringe of the islands, especially on the west coast of the Great and Little Nicobars; elsewhere, the shore line is precipitous rising to a height of 13 to 20 m.

Drainage

The Indian drainage may broadly be divided into the Bay of Bengal drainage and the Arabian Sea drainage, with distinct water partings (Fig. 1.4) lying approximately along the Sahyadri, Amarkantak, Aravallis and the Sutlej-Yamuna divide. It is also distinguished as Himalayan drainage and Peninsular drainage though several of the Peninsular streams like the Chambal, the Betwa, the Son, etc., much older in age and origin, form part of the Himalayan drainage system. This raises the problem of correlating the distributional patterns with the catastrophic and cataclysmic processes involved alternatively in defining and deranging the river courses.

Right from the Pre-Cambrian to the present, drainage alignments have assumed several distributional patterns. The Sahyadri-Aravalli alignment would have formed a probable divide in the Super continent—Gondwanaland : The tectonics and the foundering of the landmass presents a narrow area on the west and a disproportionately larger one on the east, leaving thereby short streams of some significance draining the western part into the Arabian sea, •

The rivers of the Peninsular Uplands are characterized by broad and shallow valleys with low gradients presenting almost graded profiles; their superimposed and at places resurrected and rejuvenated character is represented by waterfalls in a mature to senile topography signifying the impact

the landmass. The former now represented by the Tsangpo, the upper Sutlej and the Indus and the Oxus alignment would have been disrupted by the headward erosion of its left-hand tributaries, the Proto-Sind, the Proto-Sutlej, the Proto-Brahmaputra etc., and later captured by the present lower Irawa-

SCHEMATIC GEOLOGICAL SECTIONS

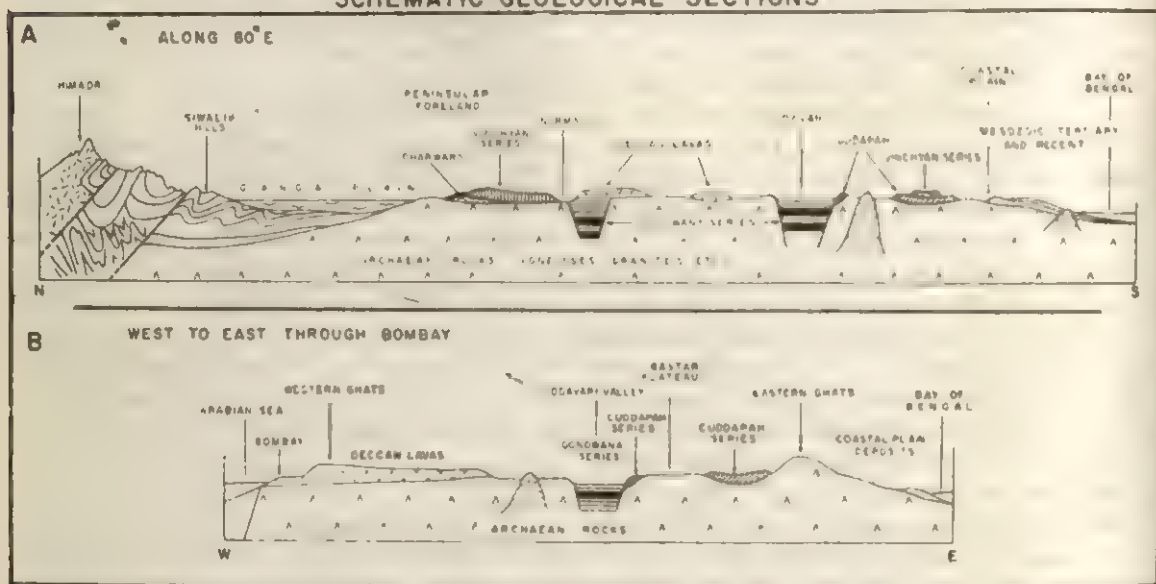


Fig. 1.5

of the Tertiary orogenic movements in the Peninsula. The rivers draining the northern face of the Peninsula, forming accidental consequent streams, have contributed to the deposition of the sediments in the Geosyncline. Some unwarranted features of the Himalayan rivers do require explanations. The foremost among them is the longitudinal courses of the streams like the Indus, the Sutlej, the Brahmaputra, etc., across the Great Himalaya i.e. the Himadri. The deep gorges cut across the Himalaya, and the still westerly flowing tributaries in their upper reaches, especially on the Tibetan Plateau provide momentum to this puzzle of the Himalayan rivers. The solution put forth by Pascoe and Pilgrim solves much of the problem. The Indobrahm or Siwalik river on the south margin and the Tibetan river to the north of the still rising Himalaya and flowing to the NW did constitute and control the drainage patterns of

ddy-Chindwin, the lower Brahmaputra, the lower Sutlej-Indus which are the probable remnants of the Siwalik river. The disruption and derangement of the 'Siwalik' might owe to the probable upward of the Delhi ridge and the foundering of the Rajmahal-Garo range, about mid-Pleistocene (500,000 years ago) due to the tensional forces resulting in the Indo-Ganga trough to its north and in the sinking of the Bay of Bengal on to its south. The whole drama of the disappearance of this link, the final dismemberment of the Siwalik river and its diversion to the Bay of Bengal was probably completed in the late Pleistocene. A cross-section across the country (Fig. 1.5) from north to south, apart from other peculiarities, is apt to point out the sudden dislocation in the form of Son-Narmada and Tapi troughs owing probably to the Cretaceous-Eocene impulses and the subsequent emissions resulting in the foundering and the formation of the rifts

occupied by their present anomalous westerly courses. Its prior easterly flow is yet to be established, though it might have looked to the Great Plains through the Son.

Drainage alignments show that most of the country is drained into the Bay of Bengal. In the Great Plains the river systems like those of the Indus and the Ganga are well integrated and reveal a generalised dendritic pattern, while on the Peninsular foreland the frequently constricted drainage, owing to the dykes and quartz veins, is more conspicuous in the Bundelkhand region. The Amarkantak region, the source of three major streams of the Peninsular India i.e. the Son, the Mahanadi and the Narmada, presents a radial drainage system on a macro scale. The parallel patterns are characteristic of the areas of mixed formations, generally the Bijawars (the Rihand and the Kanhar system in south Mirzapur) but the jointed sandstones and such other sedimentaries have given rise to rectangular drainage patterns often marked in the Vindhyan formations. The Godavari, the Krishna and the Kaveri systems in the south, the Chambal system in the north and the Damodar-Subarnarekha systems in the east are examples of superimposed drainage pattern. The Himalaya through its magnificent gorges, rising sometimes to more than 5000 m (Indus gorge at Gilgit), exhibit exemplary antecedent drainage.

Though local Phenomena, small scale river-captures and drainage derangements alongwith oscillatory changes of the river channels of axial as well as tributary streams have both geomorphic and geonomic significance. The Adwa and the Ghaggar represent the river captures in the Son Valley, while the Ganga alongwith its tributaries, notably the Kosi, the Gandak, the Ghaghara, the Tons, the Son, etc., is ever busy in oscillatory movements of the channels, especially in the Middle and Lower Plains.

Climate

Locational and physiographic factors have greatly influenced the climatic characteristics of the country. Though its considerable portion belongs to the sub-tropical zone, as a whole it shares the

characteristics of tropical monsoon climate, mainly because of the Himalaya, functioning as an effective meteorological barrier. The highest rainfall recorded at Cherrapunji (more than 1000 cm) is the result of the interplay of the vigorous sweep of the monsoon currents and the funnel-shaped alignment of the adjoining ranges. The occasional sweeps of the westerly disturbances after having transcended the north-western ranges, are oriented to the Great Plains and the northern margins of the Peninsular foreland. The subsequent snow-fall in the Himalaya and the accompanying cold waves constitute significant climatic phenomena during winter. It may, however, be noted that the Himalaya themselves represent the climatic mosaic with tropical to Alpine or Polar variations. Marine influences are also significant due to the peninsular projection of the landmass into the Indian Ocean.

As to the relative significance of the climatic elements over primary human activities, it may be remarked that temperature seldom presents an impediment to the agricultural economy over any considerable area. Disability to the economy is caused by moisture and precipitation, its uneven spatial and seasonal distribution.

Rhythm is the key-note of the monsoonal climate. The two seasons, the summer and the winter, roughly corresponding with culmination of the sun from the Southern to Northern hemisphere and vice-versa, and their associated monsoonal regimes are never mistaken and hence the Indian climate can be discussed under two heads—the summer and winter monsoons. The imbalance in their regime, owes definitely to the differential heating and cooling as the temperature starts rising much before the vernal equinox, thus cutting short the winter season by about a month. Similarly, the retarded terrestrial radiation pushes its commencement further by about a month from the autumnal equinox reducing the duration to a little over four months. The summer season is bifurcated as dry and wet or humid, roughly stretching from March to mid-June and mid-June to mid-October.

The winter season is characterised by lower temperature, sometimes below freezing at places,

low humidity and scanty rainfall. The following dry summer is marked in general by sharp rise in temperature and consequent decrease in relative humidity, giving rise to hot winds, locally called 'Loo' over some parts of the country. It may be remarked that this transition between the winter and summer monsoon is essential as it sets the stage for the outburst of the summer monsoon, which curbs the upward tendency of the temperature, sometimes in June. The wet summer or the rainy season is characterised by high humidity and fairly high temperature creating unusual sultry conditions. A short transition is also experienced between the change-over from the summer monsoon to winter sometimes during October-November.

Recently, the 'Upper Air and Perturbation School' of thought has tried to explain and integrate the dynamics of air movements in lower troposphere and upper stratosphere with the 'burst' and 'break' of the summer monsoon. The solution is provided in the withdrawal of the quasi-permanent westerly jet-stream of upper troposphere from above the northern part of the country to the north of Tibet by early June (Fig. 1.6B). Subsequently, an easterly jet-stream is developed in the lower stratosphere above the easterlies of the upper troposphere, generally lying over 15°N which might be the result of the normal global heat-exchange mechanism probably due to the disproportionate differential overheating of some region in Tibet. Unstable trough of low pressure in the upper air extends from the Bay of Bengal around the Andaman Islands towards the 'heat low' of NW India. The irregularities in these processes are directly associated with the two vagaries i.e. the onset, and break in the monsoon.⁹

Summer Season and Summer Monsoon : The monsoons are controlled by the seasonal alternating Low and High pressure conditions over the land and the sea primarily due to differential terrestrial heating. The temperature registers a sudden upward change. The condition of instability prevails throughout the country till the seasonal low is replaced in the NW by the end of May controlling the movements of air masses. The temperature occasionally fluctuates due to

the pre-monsoon thunder-showers associated with the convectional movements in the form of storms of Punjab and Uttar Pradesh and the *Kal Baisakhi* (Nor'westers) of Bengal, but the rise is checked only with the outburst of the monsoon. Areal significance of pre-monsoon rainfall varies from region to region. For instance, it shares 26% of annual precipitation in Assam, 17% in Bengal, 15% in Mysore, 13% in S. E. Tamilnadu, 4% in West U. P. and 0.7% in Gujarat.

The spatial distribution of the average seasonal temperature ranges from 20°C over the high altitudes of the Himalaya and South Sahyadri to more than 30°C along the desert frontiers and Tamilnadu coast. The pressure distribution ranges from about 980 mb in the NW to about 1010 mb over the sea and controls the general wind direction. The relative humidity rises to above 80%.

The rainfall over the country is primarily orographic, associated with tropical depressions originating in the Bay of Bengal and the Arabian Sea. The summer monsoon accounts for most of the rainfall in the country, with uneven spatial distribution almost in sympathy with the orography (Sahyadri, Eastern Himalaya, Meghalaya 200 cm and parts of Karnatak-Maharashtra Plateau, Punjab, Western U.P. and Rajasthan less than 60 cm). Its uncertainty of occurrence marked by prolonged dry spells and fluctuations in seasonal and annual amount is a serious problem indeed.

Peculiarly enough, the westward decreasing rainfall, in the northern part of the country, shows a reverse trend in its percentage share in the total annual precipitation which varies from 66% in Assam to 96% in Gujarat. The only exception to the high share of summer monsoon rain in the country is the south-eastern Tamilnadu region (about 34%) where retreating monsoon has greater influence (about 39%).

The coefficient of variability reveals the increasing fluctuation in seasonal rainfall from east to west in the Great Plains and the Northern Peninsula (Sambalpur 14.6%, Jalpaiguri 16.3%, Silchar 17%, Nagpur 23.4%, Allahabad 28%, Delhi 33.3%, Bikaner 48.4%, Bhuj 60%), while on the Southern Peninsular Uplands it is from

west to east (Kozhikode 16.3%, Bangalore 21.7% and Madras 30.3%). Thus the varifall reliability in general is inverse to the total amount. The areas with marginal rainfall suffer worst. (Fig.1.6A)

Winter season and Winter Monsoon : The winter monsoon commences after a short transitional span and lasts from mid-October to February. Associated with decrease in temperature and relative humidity, this period is responsible for a small amount (below 10% of annual total) of welcome rain in the country. In Tamilnadu, Kerala and Mysore, however, the winter monsoon rain is more significant, (S.E. Tamilnadu 39%, Madras coast 25%, Mysore 21%, Malabar 16%). Northern India is affected by the western disturbances mainly between December and February with decreasing intensity from west to east, and the share of precipitation varies accordingly (Kashmir 22%, Punjab 12%, Western U.P. 6%, Bengal 2% etc.). These disturbances often cause snowfall in the Himalaya and the subsequent sweep of the cold wave over the Great Plains bringing down the temperature occasionally below freezing point.

Climatic Regions : Spatial patterning of the climatic phenomena can be very well marked in the country and is reflected in the regional variations. For instance, in the Great Plains, the dry Western Rajasthan is in contrast with the humid eastern section consisting of Assam Valley and the Lower Ganga Plain. So secular is the change that within the expanse of over two thousand kilometers, no sharp demarcation can be observed though attempted tentatively at 150 cm, 100 cm and 75 cm isohyets from east to west.

A systematic study of the Indian climate was first attempted by Blanford towards the close of the 19th century. Somewhat more systematic regionalisation was made by Koppen (1918) who divided the country into three broad climatic zones—arid, semi-arid and humid. By introducing other attributes like duration of wet and dry months etc., a much more complex classification was attempted by Thornthwaite whose attributes pooled more on the derivatives like P/E and T/E rather than the absolute statistics of temperature, rainfall, etc. But in spite of its capacity to

divide the country into more regions, it wrongly puts most of its parts as megathermal. Subrahmanyam (1955) applied Thornthwaite's technique to India and concluded that the country is more arid than what has been considered. Further classifications could not be well defined for one factor or the other. Recently, Bharucha and Shanbhag (1957), on a line similar to Thornthwaite, attempted the classification by simplifying the P/E and T/E ratios but like the former designed their scheme for vegetation climatology.

The simpler and practicable scheme appears to be that of Kendrew and Stamp whose classification bears generalised regions with quantitative limits of the attributes. With some modifications, the same has been adopted here as it is more helpful in the delineation of regions of the country. As many as ten climatic regions have been identified (Fig. 1.10 inset).

Soils

The Indian soils have developed under hot and humid climate over the bed rocks of complex nature, predominantly under the process of Laterization, though Podzolisation is not unrepresented in the country. The tints, chemical composition, texture, structure, reaction and plant food contents, bear large scale as well as local variations, according to environments. Even on village level these can be marked. The human settlement too is responsible for converting even poor quality land around it into richer one with respect to humus, texture, etc. It is so significant that land rental is levied according to the distance from a settlement such that $rx1/d$, and the land has a classification into *Goind* to *Palo* in North India (similar local terms elsewhere).

A consideration of all the factors in identifying the zones on macro level will certainly be an impracticable if not an impossible task. The climate and lithology together, therefore, have been taken into account to achieve this end. But at places the processes of denudation and their dominance, such as in coastal regions, have not been ignored. Thus 6 soil groups incorporating 11 types have been identified (Fig. 1.7).

A. The soils of alluvial tracts on macro scale

can only be mapped in the Great Plains. Elsewhere these are found in the deltas and river valleys of local significance. These soils, generally one foot deep with ill-defined horizons, form the base of India's agricultural economy.

The two sub-types—(i) Alluvial Loam and (ii) Calcareous clayey alluvial are identical with the low-lying younger, floodplain alluvium locally known as Khadar and the older alluvium seldom liable to inundation known as Bhangar respectively. Annual siltation in the former case is apt to revive its fertility, while the latter, prone to more leaching, requires recurrent manuring to maintain the fertility status. The *kankar*, at times as sheets or clay particles, imparts the Bhangar its distinguishing character. The depressions in Bhangar are better suited to rice crop, while the rest is used for other crops. The Khadar soils are richer in humus but often give only one crop as during monsoon season they remain overflowed.

B. Lava Soils (Black Soils) : Black soils, locally known as *regur* and, in general, the black cotton soil, have developed over the lava deposits by the weathering of the Trap in major parts of Maharashtra, western Madhya Pradesh, Gujarat and the adjoining parts of Andhra Pradesh and Mysore. An isolated enclave of these soils is also found in the Kaveri valley (Tamilnadu), which like other riverine soils are re-deposited. Fairly rich in plant food, highly sticky in character with better moisture-retaining capacity, the soils crack heavily in summer and are self-ploughing. These soils are alkaline in reaction. They are deficient in nitrogen, phosphoric acid and organic matter, though having sufficient lime, potash, etc. The two broad groups, (iii) Trappean Black Clayey soils and (iv) Trappean Black Loamy soils are mainly based on the proportion of clay and silts. The former has a more extensive areal coverage and is very heavy owing to finer constituents (65%-80%). The Black Loamy soils occur in patches notably in the Wainganga valley and Northern Konkan coast. The silt content varies between 30% and 40%.

C. Soils of the Archaean and Cambrian Rocks : Also known as the omnibus group, have deve-

loped over Archaean granite, gneiss and other crystalline rocks, the sedimentaries of the Cuddapah and Vindhyan basins and the mixed Dharwarian group of rocks. The zone covers a large part of the Peninsular Uplands, especially in the east, south and north, thus encircling the Black Cotton Soil Zone. Local slopes, drainage, climatic and vegetal conditions alongwith the rock-constituents have provided distinctive characteristics to allow sub-regional variation. These rather 'in situ' developments under the laterization process render it the name 'fossil' or 'arrested' soils. In river valleys they are deep enough and under continuous use as paddy field at places have podzolised. Texturally the soils are sandy to loamy and even gravelly on the upper slopes of the river valleys. On the fringes they are interdigitated with bordering soil groups through the floodplains and terraces. In general, they are porous with lesser moisture-retaining capacity. These sub-zones discernible are (v) Red Loam Soil, (vi) Red Sandy Soil and (vii) Lateritic soil.

Argillaceous materials, cloddy structure and some concretionary materials alongwith the characteristic neutral reaction owing to the acidic parent rocks characterize the Red Loamy Soils which cover major parts of Chotanagpur Highlands, Chhattisgarh basin, northern Bundelkhand, the eastern slopes of Malnad, Rayalaseema and South Sahyadri alongwith its eastern slopes. They are porous, light-textured and friable. Absence of lime, *kankar* and free carbonates and deficiencies of nitrogen, phosphorus and humus also mark the characteristic of this soil group.

The adjoining counterparts of Red Loamy Soils are dominated by red soils with sandy texture. The undulating topography with somewhat perfect drainage is the potent factor for their development. Among the broad zones of the country under this type are the Eastern Madhya Pradesh, excluding Chhattisgarh basin, adjoining Orissa hills and Andhra Ghats and the Tamilnadu Ghats and the flanks. These soils are also developed over the narrow strip along the Sahyadri. Intense leaching is a menace to these soils. They are characterized by stunted forest growth and are suited to drought resistant crops.

The Lateritic Soils, developed under the hot and humid climate, differ from the other types of the red soils, mainly in mineral constituents. Lateritic weathering of basic and intermediate rocks like granite by hydrolysis, develops this type of soil. When dry, the soils become cloddy and rocklike. The successive lowering of the base levels and of the water table in such areas results in the development of thick cover over the terraces, benches and level summits, locally known as 'Pats' in Chotanagpur Highlands.

D. Mountain Soils : Himalayan soils form a mosaic varying from deep alluvium in the valleys to highly immature gravelly soils with variations in accordance with the altitudinal and vegetational zones. The soils are least studied and often the vegetation cover guides their classification. However, on the macro scale only the two broad groups can be mentioned : (viii) Podzolic soils and (ix) other Mountain Soils. Conspicuously enough, the Podzols occupy the mid-altitudinal zone in the Himalaya; the true Podzolic soils correspond with the deodar, chir and blue pine areas, being characteristic of the cold moist winter and mild summer. The soils are acidic in character with low humus.

Other Mountain Soils are least studied. Whatever sample studies have been undertaken hardly speak of any systematic zoning in the region. Depending on the forest cover, rocks, slope and rainfall, some types have been given as Brown Earth type, Red Loam, Rendzina, Gley, etc. Subsoil surface of the frozen areas remains under snow. Soil profiles are in general immature.

E. Sandy Desert Soils : Occur in parts of Rajasthan, Saurashtra and Kutch and are developed under arid and semi-arid weathering. The soil is sandy to gravelly with low organic matter, low nitrogen and other plant nutrients. The mechanical composition reveals that, on the average, sand content varies from about 46% in the eastern part (Kekri) to 95% (Pushkar) in the west. There is absence of calcium carbonate. Saline soils are local variants occurring in small patches.

F. Coastal Soils vary in texture and structure. East coast has riverain soils in the delta regions as well as in areas where tidal waves and currents

have deposited silt and sand which are at places saline. Marshy tracts are local variations well marked particularly in the deltaic and inter-deltaic regions, backwaters, etc.

Flora

Complex physiographic, climatic and pedological conditions have given rise to as many as 30,000 species of plants in the country ranging from thorny bushes (Rajasthan etc.) to evergreen forests (Assam etc.) belonging to dominant families such as *Orchidaceae*, *Leguminosae*, *Gramineae*, *Euphorbiaceae*, *Acanthaceae*, *Compositae*, *Cyperaceae*, *Labiatae* and *Urticaceae*. Families belonging to tropical origin, owing to location on the one hand, and the polar, due to high altitude on the other, are all represented here and have floristic affinities with Burmese and Chinese species; there are also some akin to the species of Australia, Malayasia, East Africa etc., especially found in the Himalaya and the Western Rajasthan.

Forests are dominant natural vegetal cover in India. Out of the total coverage of 554,480 km² accounting for about one-sixth (17%) of the country's area, the forest cover falls far behind the international one-third optimal acreage, and that too is shared unevenly by different states—M.P. 25.9%, Andhra Pradesh 11.3%, Maharashtra 10%, U.P. and Bihar 6.7%, Orissa and Assam 6.3% each, Jammu and Kashmir 5.7%, Mysore 5%, and rest of India 16.1%. Even the shares of various States vary from almost nothing (Delhi 1.5%, Rajasthan 2.5%, Punjab 3%) to nearly one-third (Himachal Pradesh 33%, Madhya Pradesh 31%, Kerala 28%). Exceptionally high shares are exhibited by Tripura (63%) and the Andaman-Nicobar Islands (79%), respectively. This distribution can hardly reflect true nature of the original cover in the past; much of the forest cover, especially in the Great Plains, has been removed due to Human occupance since nearly 5000 years. Here are now noticeable groves and scrub jungle especially in areas of badland topography like that of the Chambal Valley.

Even with this dismal position, only 55% of the acreage is under direct control of the Govern-

ment, the rest being left to unscientific and wasteful uses by men and animals or biological organisms. Forest produce is still economically significant providing as it does raw materials to shellac, paper, plywood, resin, furniture and several other industries.

The climate, land, species, singly or in combination, define the forest types. Here Champion's scheme modified by Puri has been adopted as follows with 5 major groups and 16 sub-groups (Fig. 1.7 inset).¹⁰

A. *Moist Tropical Forests* : 1. *Tropical wet evergreen forests* form dense canopy in the areas of high rainfall (more than 250 cm) and grow on different altitudinal zones (upto 1070 m in Assam and 1370 m on the Sahyadri). These multistoried forests become impenetrable owing to luxuriant under-growth. Main species are *Dipterocarps* (famili) and Sal (*Shorea*) etc. in the North found in Assam and Bengal and *Ilopa* in the South on the West Coast, Anaimalai Hills, Mysore Plateau, Coorg etc. in the South alongwith the Andaman Islands.

2. *Tropical moist semi-evergreen forests* are mostly confined to the Western Ghats, Assam Valley and Bengal and Orissa coasts lying between the rainfall zone of 200-250 cm. This mixed variety of evergreen and deciduous forests comprises in general of *Eugenia cinnamomum*. The under growing climbers provide an evergreen character to these forests.

3. Most characteristic to the country are the deciduous forests. *Moist deciduous forests* occur on the Peninsular Uplands flanked between the Western and the Eastern Ghats. Sal (*Shorea robusta*) and teak (*Tectona grandis*) constitute commercially the most significant species, the former occupying the relatively wetter northern parts of the Peninsula. Teak is more characteristic of drier Madhya Pradesh and is commercially known as 'C.P. Teak'. Suited more to the calcareous and phosphoric soils, it is seldom found in pure stands and extensive stretches. In addition to teak, are found other hardwood species such as shisham (*Dalbergia sissoo*) along the eastern sub-Himalayan zone, Mysore and Maharashtra and sandal wood (*Santalum album*) and

rose wood in Mysore which are in great demand for construction, furniture, carved boxes, etc. Sandal wood oil is also a notable produce. The Hutra (*Terminalia chebula*) is more significant for its fruits and myrobalans, providing tan stuff on commercial scale. Mahua (*Bassia palifolia*) and Khair (*Acacia catechu*) are other significant widely distributed species.

4. *The Sal forest* : The Sal, being more gregarious and found in purer stands is more significant commercially and its annual turn-out is greater than that of any other species. It is common in the Chotanagpur Highlands, Baghelkhand, Orissa Hills and adjoining Eastern Ghats. Varied natural environments have induced local variations in its species. It avoids pure sands and clays and too dry or too wet conditions.

5. *Tidal forests*: Characteristic of the sea faces of the deltas, estuaries, and creeks, are open forests of mangroves prone to tidal influences. Hardwood species like Sundri (*Heritiera fomes*) occupy the relatively lower sections while higher ground supports screwpines (*Pandanus spp.*), canes and palms. *Nipā fruticans* (a palm) occupy the creeks and have a direct springing up from marshes. Epiphytes are predominant all over. The wood of this forest is very often used for fuel and boat making.

B. *Dry Tropical Forests* : Dry Tropical species are confined to the areas with less than 100 cm rainfall, having local variations.

6. The *dry evergreen* species are highly local in distribution, confined to the East Coast Plain between Point Calmère and Madras.

7. The *dry deciduous forests* are similar to the moist deciduous. As a transitional species they are found in areas with long dry season, such as the central part of the Peninsula, the Siwaliks and Western Tarai from Himachal to the Nepal border.

8. The areas below 75 cm rainfall, i.e. the eastern slopes of the Aravallis and the Western Ghats are occupied by forests with stunted growth, often degenerating to bushes. Shorter species are common. Wild date (*Phoenix sylvestris*) is common in relatively damper pockets.

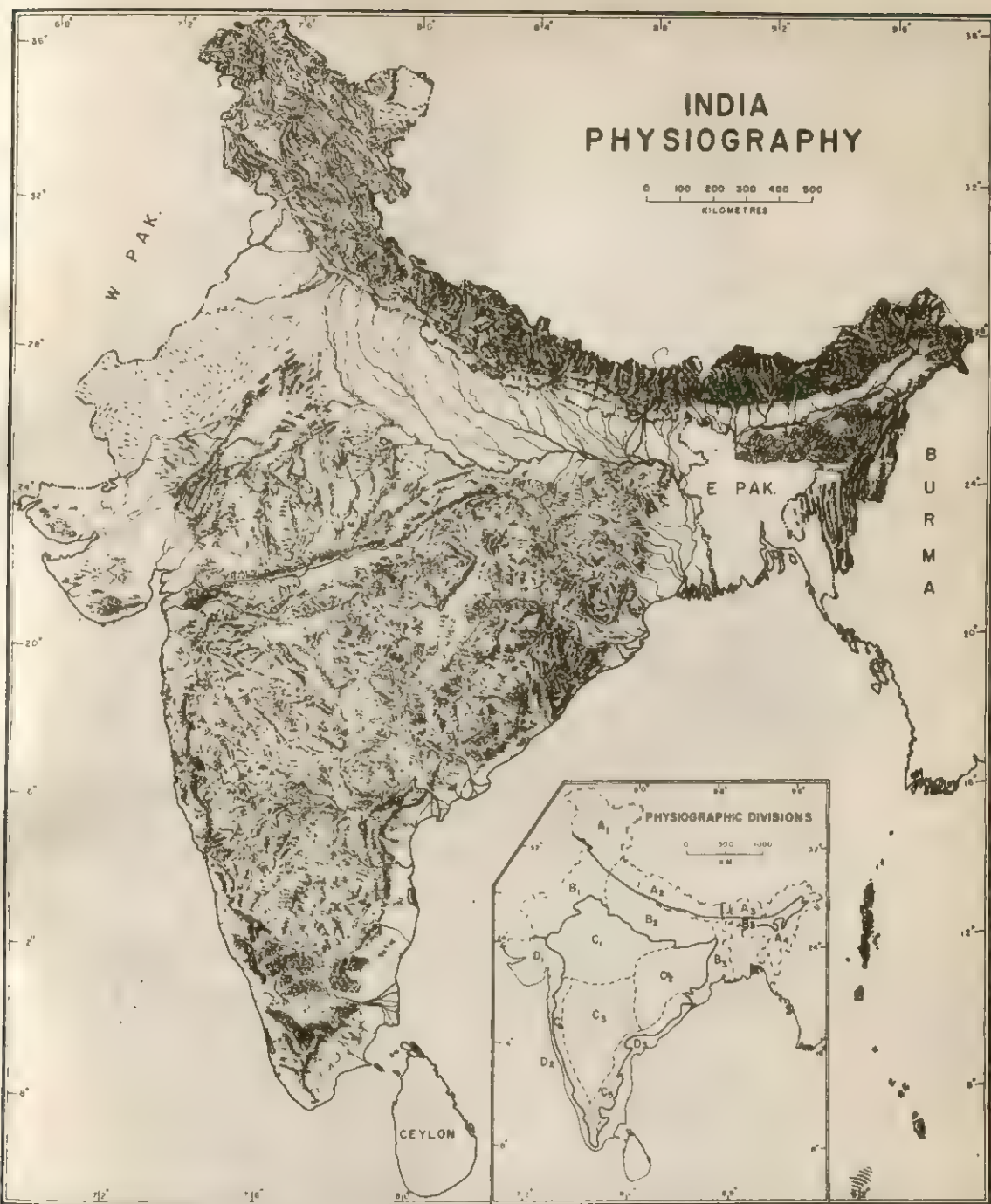


FIG. 3 INSET A, NORTHERN MOUNTAINS 1, Western, 2, Central, 3, Eastern, 4, Assam-Meghalaya Hills B, GREAT PLAINS 1, Western Plain, 2, Central Plain, 3, Eastern Plain - C, PENINSULAR UPLAND, 1, Aravalli-Satpura uplands, 2, North Eastern upland complex, 3, Deccan uplands, 4, Western Ghats, 5, Eastern Ghats D, COASTAL PLAINS 1, Gujarat Coastal Plain, 2, West Coast Plain, 3, East Coast Plain

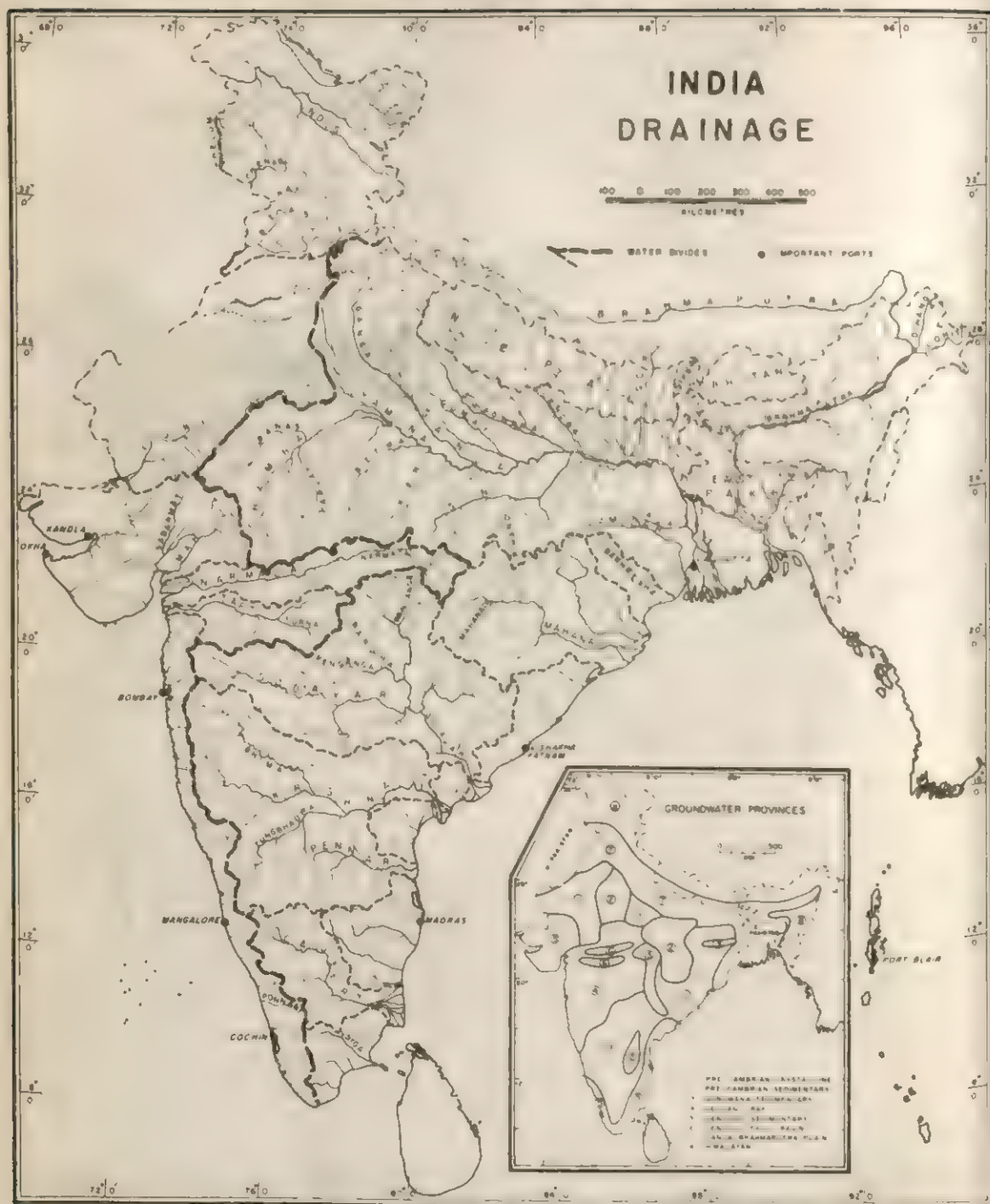


FIG 14

INDIA CLIMATIC CONDITIONS

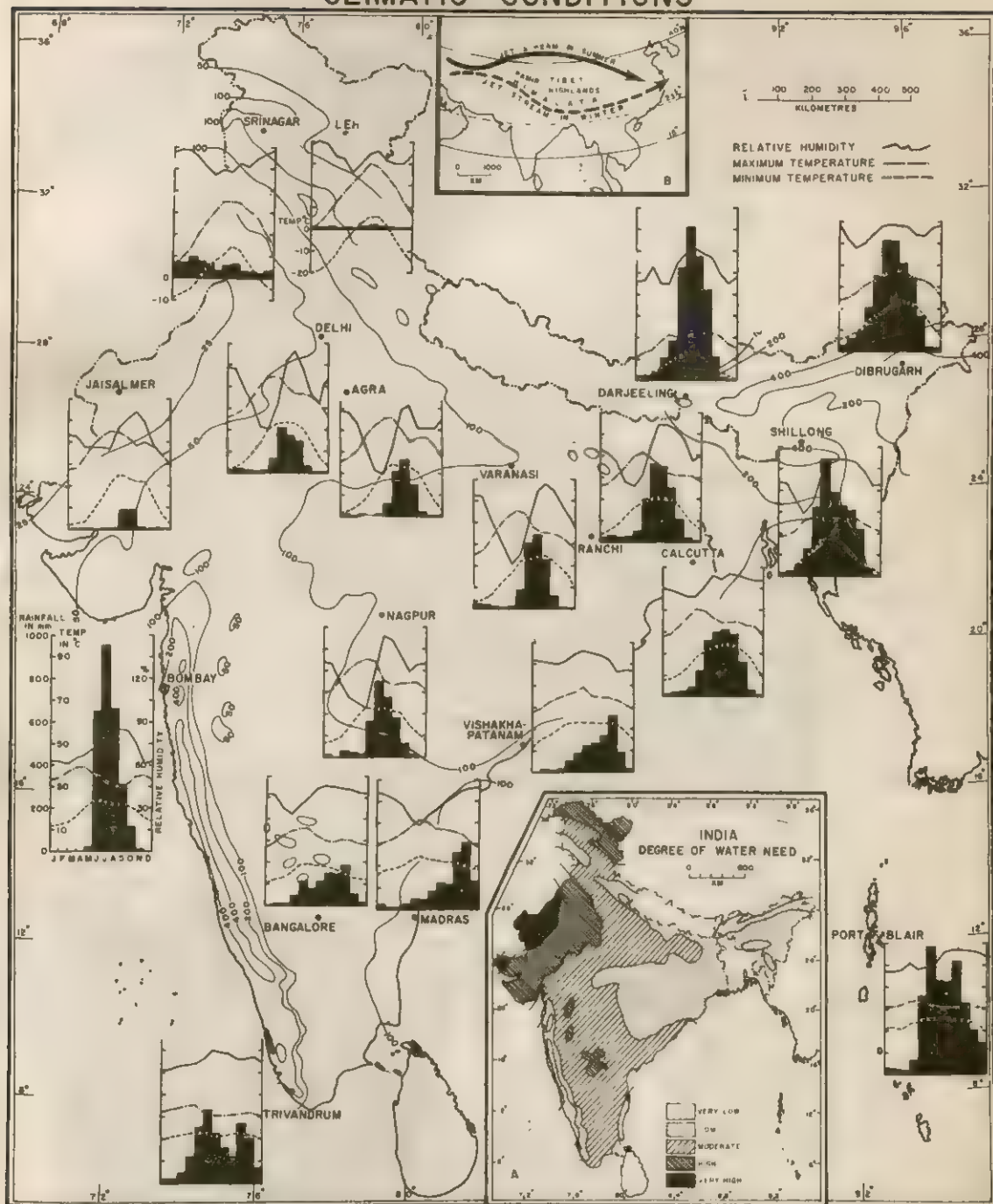


FIG 16

SOILS

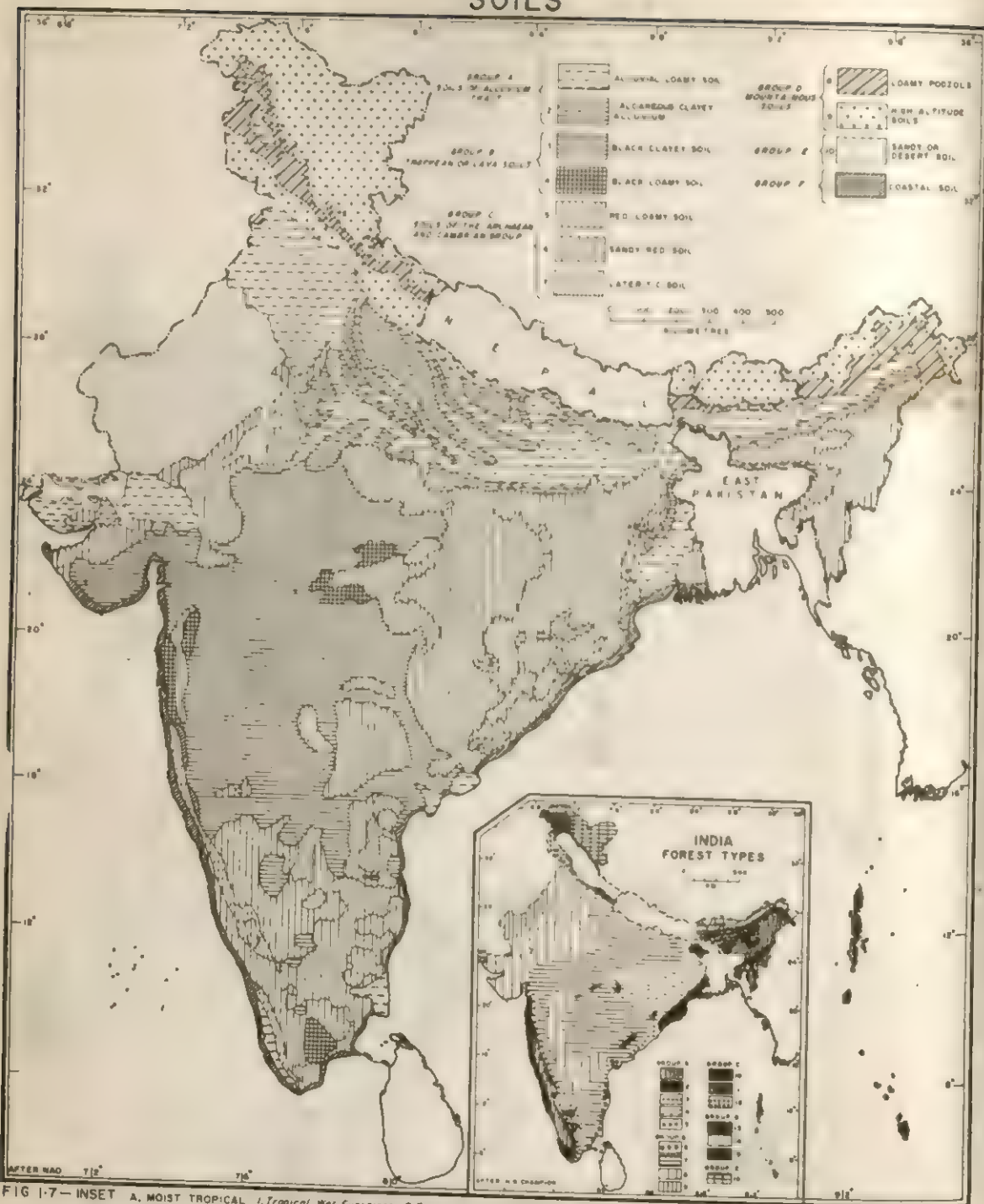


FIG 1-7—INSET

A. MOIST TROPICAL 1. Tropical Wet Evergreen, 2. Tropical Moist Semi-Evergreen, 3. Tropical Moist Deciduous, 4. Tropical Moist Deciduous (Salt), 5. Tropical Dry Evergreen, 6. Tropical Dry Deciduous, 7. Tropical Thorny Bushes, 8. Desert type, 9. Subtropical, 10. Dry Temperate, 11. Alpine, 12. Alpine Forest

9. Further west of the Aravallis the desert vegetation comprising short berries, palm etc. are common in the sandy expanse of the Thar.

C. *Sub-Tropical Forests*: These Forests are more related to certain altitudinal conditions and resultant climatic environments. These are the main sources of soft wood in the country.

10. *Sub-Tropical Wet Forests* are common on the Nilgiris and the Palnis (1070-1525 m). As stunted rain forests, they occur on the higher Sahyadri, the Satpuras and the Maikals. On the Himalaya the zone of 1000-2000 m, east of 88° E, is covered by the type consisting in general of oaks and chestnuts along with patches of ash and beech. On lower margins sal also grows.

11. *Pine forests* occur in the Western Himalaya (73°-88° E) in a zone contiguous to the above. Admixtures to pine are oak and chir, the latter being more of commercial and industrial significance as it is suitable for furniture, boxes, construction, railway sleepers etc. Resin is also a significant product. Sufficient raw material is available for paper industry.

12. Himalayan foot hills in Kashmir (Jammu Hill—450-1500 m) with a rainfall of 50-100 cm are covered by wild olives (*Olea cuspidata*) and patches of *Acacia modesta* representing the *Sub-tropical dry evergreen forests*. Low and scrubby in character, they are frequently used as fuel and fodder.

D. *Temperate Forests*: are characteristically high-altitude forests classified in three sub-types.

13. *Wet temperate type* is characterised by both tropical and temperate elements as it has ample under-growth. Magnolias, laurels, rhododendrons, prunus, etc., are the common varieties along with the exotics as cinchona and eucalyptus. Common areas of growth are the valley-sides of the Nilgiris, Anaimalai and other hills with more than 150 cm rainfall and above 1500 m elevation.

14. *The moist type* is found in the altitudinal zones of 1800-2800 m and 1500-3500 m. These are the mixed species of broad-leaved evergreens and the conifers. Pine, chir, deodar are the most common species. Deodar is more common in the west.

15. *The Dry type* is found on the leeward side of the Himalaya with 100 cm rainfall and is characterised by conifers like deodars.

E. 16. *The High Altitude type* is found beyond 3400 m on the Himalaya. The environments seldom permit larger trees. The vegetation in general is shrub-like. Only rhododendrons at some places attain a height of more than 10 m.

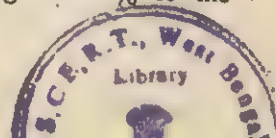
Indian forests species, discussed so far, do well in certain environments but there are some species such as bamboo, cane, reeds, neem, pipal, banyan, tamarind, palm etc., which grow all over the country from Cape Comorin to the foot-hills of the Himalaya. Environmental effect is, no doubt, reflected in their size. Bamboo, originally used as raw material for construction, different domestic utensils, furnitures, etc., has now become a significant raw material for paper industry.

Grasslands, on a sizable scale, no longer exist in India. Much of the surface area (about 59%) is under dense forest cover and cultivation. The rocky wastes, the sandy dry stretches and snow-clad parts constitute high proportion of the remaining land surface. The Pastures with scrubs and grass are found in patches usually in the arid to sub-humid areas of the country. Like forests, grasslands also have variation in accordance with the natural environment in general and soil moisture in particular. In the western margin of U.P. and the sub-humid Madhya Pradesh, Andhra Ghats, etc., are found patches of coarse grasses, much more sensitive to over-grazing and burning. Sandier and humid soils are covered with poor quality grasses and scrubs over bare eroded surfaces.

Subtropical Himalaya, above 1400 m, has considerable stretches of mostly induced grasslands from western Himalaya to the Burma border. Economically and commercially significant are the Himalayan meadows in the Kangra-Kulu, Kashmir and U.P. Himalaya, encouraging transhumance.

Fauna

The faunal species in India are varied and complex. As many as 76,000 species of animals have been listed, accounting for 8.2% of the



known living world species (920,000; Roonwal 1959).¹¹ They include both vertebrate which are almost well-known in the country and invertebrate fauna of which only about one-half are known. The study of fauna includes their characteristics, distribution, game animals, and wild life preservation and the basic ecological balance between man and wild life. Some of the species are also able to explain the continuity of the older landmasses such as the fresh water fish fauna of India originated in South East Asia (Hora, 1937)¹² and Malay Archipelago (Ekman, 1953) and are different from the Central Asian Fishes. Moreau (1952) concluded that South Asian avifauna evolved in Africa. Even at present the 176 endemic species belong to Palaeartic (17%), Ethiopian (17%) and Indo-Chinese (62%). Mammals of India have several genera, typically oriental but Ethiopian and Palaeartic elements are also there.

Indian fauna, (comprising microscopic Protozoa to the larger Mammals) broadly speaking, can be divided into two groups : 1. Invertebrate and 2. Chordata (including the vertebrates).

1. Invertebrata have eleven sub-phyla and include tiny microscopic unicellular or acellular creatures. They are either the free living forms in the soils, in freshwater and marine environments or parasites in the body of both vertebrates and invertebrates on the one hand, and the species of economic significance as sources of raw material for buttons etc. on the other. Pearl Oyster is also a species in the group.

2. The Chordata which consist of five sub-phyla (Hemichorda, Urochorda, Acrania, Agnatha and Gnathostomata). The last two are vertebrata. The marine worm-like creatures without legs, lancelets, hag fishes, reptiles, birds and mammals constitute this group. As many as 1650 species of fishes (Roonwal, 1965)¹³ have been so far recorded, of which fresh water species are 21% while 69% and 10% are marine and deep-sea species respectively. The serpent family is also very varied. Nearly 400 species of snakes are found in India though only one-fifth are poisonous. Common species (non-poisonous) are *dhawan*, wolf snake, sea snake etc, while the poisonous family comprises *kraits* and cobra (Elapida family)

having eleven species. Other worth-mentioning snakes are worm-snakes, blindsnakes etc. India is rich in avifauna, both in variety and number (14% of the total known species of the world). They include divers, grobes, ducks, birds of prey and game birds—pigeons, cuckoos, etc. Mammalian fauna are also significant with 458 species and 920 sub-species in the country. They include gibbons and monkeys, cats, bears, dogs, foxes, etc. *Panthera* is found in four species. Other mammals include elephants, horses and asses, pigs, deer, bovidae (cattle, sheep, etc.), lions, tigers, hare, etc.

The free-hand use of the wild life for games since centuries and the rapid deforestation in the country have led to considerable depletion of our wild life which is resulting in an ecological imbalance between man and wild-life. The process was accelerated during and after World War II. Several species are almost extinct (eg. Cheeta) or are on the verge of extinction; worth-mentioning are Asian Lion, the Kashmir Stag, etc. *Chital*, blackbuck, *sambar*, *nilgai*, bear, panther and tiger are amongst the game mammals; while duck and geese, whistling teals, snipe, etc. are amongst the game birds.

Towards the preservation of wild life there is an urgency of putting a check to the unwarranted killing of the faunal species. Our culture, which forbids the hunting of certain animals has since long been a cause of their preservation in certain areas such as Rajasthan, Gujarat, etc. thus peacock is still plentiful in these areas. In ancient India *Abhaya Aranyaka* provided sanctuaries for the preservation of wild life. Efforts, no doubt, are being made by the Government and private societies towards the conservation of wild life. As such, about 47 wild life sanctuaries, reserves and national parks varying in area from 23 km² to 1550 km² have been established for this purpose. Notable amongst these are the Gir forest (Gujarat), Jaldapara (W. Bengal) and Kaziranga (Assam) for preserving certain species. In addition to preserving our wild life heritage, they also serve as areas of scenic beauty. Recently we have adopted lion as our national animal and the peacock as our national bird.

The processes of civilisation through the clearing of forests, opening vast tracts for cultivation and settlement, erection of dams, reservoir etc. and laying of transportation network etc. have pushed back the wild life. A distinct ecological imbalance has been created in the country with the growing population and declining wild life so that certain species have become rare or have no trace at all. This itself becomes root of certain evils caused by the wild animals such as the problem of man-eater might have grown with the decline of their food animals and thereby forcing them to cattle-lifting and lastly man eating. The need, therefore, is not only to allow them their natural growth without human interference but also to increase their number so that the ecological balance is restored.

The Cultural Setting

Population

Among the countries of the world, India ranks second in population and seventh in land area. It has 15% of the world population and 2.2% of the area. India's population in 1961 stood at 439 million; it had risen to 500 million by 1965 giving a density of 138 persons per km² in 1961 and 152 in 1965. The population is likely to increase to 640 million in 1976 and 720 million in 1981. Since Independence, India has added roughly 160 million to its population, a figure equivalent to the combined population of Pakistan, Burma, Ceylon and Nepal. Every year, 11 million people are added to our population. The year 1921 is known as a 'big divide' preceded by slow and followed by rapid increase in population. India is, thus, undergoing a period of rapid demographic transition. The main cause is the decline in death rate from 39.6 per mille in 1891 to 22.8 in 1961, while in the same period birth rate declined from 48.8 to only 41.7. Expectation of life increased from 25 years in 1891 to 41 years in 1961. India has a pyramidal age-structure. Nearly 41% of the population is below the age of 15 and only about 8% above the age of 55.

The ratio of urban population to total population has increased very slowly. The increase is

from 11% in 1901 to 18% in 1961. Further, 44% of the urban population lives in 107 cities of more than 100,000 population each. There are only 7 cities with a population of over one million. The urban concentration (Fig. 1.8 and 1.15 inset) more or less conforms to the pattern of population distribution. There are distinct areas of urban concentration in the Ganga Plain, the deltas of the Krishna, the Godavari and the Kaveri and the Kerala coastal plain. These areas have multiple urban clusters and also a great deal of urban scatter. Further, they are becoming more urbanized. The states with high urban concentration are Kerala, Tamilnadu, Maharashtra, Uttar Pradesh, West Bengal and Punjab, with medium urban concentration are Andhra Pradesh, Mysore, Bihar and Gujarat; and with low urban concentration are Assam, Madhya Pradesh, Orissa, Rajasthan and Jammu and Kashmir. Since Independence, a number of new planned towns have been established. They include the capital towns like Chandigarh (Punjab) and Bhubaneswar (Orissa), the steel towns like Durgapur, Bhilai and Rourkela and the port towns like Paradeep and Kandla. Between 1941-1961 nearly 14.2 million persons moved from rural to urban areas. There is a stream of migration flowing not only towards large metropolitan cities and big industrial centres but also to hundreds of medium sized and smaller cities. However, there are certain economic costs of cities in terms of housing, roads, water supply, sewage, education and medical facilities etc., which the Indian economy is not in a position to bear. The urban growth in India has been largely unplanned and if economic and social wastes are to be avoided, serious thought must be given to the problem of balanced rural-urban development.

According to 1961 census, 43% of the total was working population (129 million males and 60 million females). The proportion of persons employed in the secondary (12.68%) and tertiary (19.39%) sectors is small and evidently the primary sector (67.98%) predominates. In the last two decades, there has been a slight increase in the proportion of males employed in secondary and tertiary sectors but a fairly distinct decrease

in the case of female employment has occurred although there is net increase in absolute numbers.

The population density map (Fig. 1.8 inset) shows very uneven distribution. Areas of high density correspond with fertile well-watered river basins and coastal plains. About half the population of India is concentrated over one-fourth of its land area. Thus the population pressure is fairly acute in the relatively favoured agricultural tracts. With the exception of certain small Union Territories like Delhi (1792 per km²), Laccadive, Minicoy and Amindivi Islands (831), Pondicherry (771), where the degree of concentration is startling, high densities are found in Malabar Coast, Lower Bhagirathi delta, Eastern U.P., North Bihar Plain and some metropolitan areas like Calcutta and Bombay, and the industrial districts. In contrast, the Peninsular India, except for a small area, shows a scattering of population. Forested hills and plateaus in central part have conspicuously low density (below 50 per km²). Some of the relatively negative areas are located in the mountains in the north and east and the arid region in the west. NEFA and Jaisalmer exhibit a density of only 4 persons per km². However, some of the Himalayan valleys carry very high density of population; in the Kangra valley, in the Himalayan-Beas basin, the density per cultivated km² is as high as 663 persons.¹⁴

Compared to the high rate of population growth, the geographic redistribution of population has not been a dynamic process. Some changes in population distribution occurred as an aftermath of Partition. Redistribution of India's population between rural and urban areas has been slow. The population pressure in rural areas is further aggravated by a large natural increase and it is estimated that the per capita holding would decrease from 0.40 hectare in 1961 to 0.34 hectare in 1971. Further, during 1961-71, a labour force of 11 million would be added seeking work in rural areas. Migration in relation to total population remains small though it is fairly large in absolute numbers. Generally, people move from densely peopled or from arid and drought zones to areas of newly developed agricultural

lands and to urban-industrial districts. Movements are, by and large, over short distances. To assess the latest capacity of the country in supporting population, P. Sen Gupta¹⁵ has attempted a division of India into population resource regions according to the combined impact of demographic structure of population (density and growth rate), resource potentiality and levels of socio-economic development. The 19 regions thus classified are grouped into three characteristic population-resource regions : dynamic, prospective and problematic (Fig. 1.9). Dynamic regions are those which support advanced industrial areas and predominantly urban population with scientific and technological components for tapping unexploited resources and helping to divert population from crowded rural areas. These include North Eastern Region, Godavari Basin, Aravalli Hills and Malwa Plateau, Western and Southern Karnataka Plateau including Goa District, and Assam Valley. The Problem Areas are those which show little promise at least for immediate future. These include Middle and Lower Ganga Plain, Orissa Coast, Kerala Coast, the Laccadive, Minicoy and Amindivi Islands, N.E. Karnataka Plateau, Rayalaseema (Andhra, Pradesh), Marathwada and Konkan Coast, Rajasthan Desert including Kutch Peninsula, the North-Western Himalaya, the Purvachal and Plateaus, and the Andaman and Nicobar Islands. These regions, however, may be treated as tentative but will hold good, till more elaborate analysis of population and its resource relationship is worked out.

India has reasonably good resources. However, the adequacy of resources depends not so much on the physical resources as on its state of culture and technology. India is making valiant efforts to solve its problems particularly the problem of food and population. Overpopulation results when resource development does not go hand in hand or ahead of population growth, and the growth of tertiary services lags behind technical progress. India's population has grown from 235 million in 1901 to about 439 million in 1961 (Fig. 1.9 inset). At the same time there has been distinct decline in per capita holding.

Present trends of population are such as to aggravate the inequality of numbers in relation to the means of production. Considered by each of the several criteria such as nutritional level, national income, employment in secondary and tertiary sectors, per capita energy consumption and industrial production, India is at the present state of resource-use and technology both underdeveloped and over-populated. It can be said to resemble Ackerman's Egyptian type population-resource region. In recent years, however, there has been appreciable development in agriculture and industry. Large population increases (at 2.5% per annum) have neutralized the benefits of development and increased production. High population growth is deterrent to economic betterment. The high growth is mainly due to rapid decline in death rate and negligible decline in birth rate. If the birth rate does not fall, the problem of economic development will be further aggravated. India has, therefore, adopted the policy of stabilising the growth of population. The immediate objective is to reduce the birth rate from the present 41.7 in 1961 to 25 by 1976 and to 18 by 1985-86. The effect of this will be that population will be only 693 million in 1985-86 instead of unchecked growth of 880 million. A large network of family planning centres has been set up. The number of such centres has gone up from 1,649 in 1960-61 to 16,970 in 1965-66; 14,830 of these were in rural areas. Family planning involves a change in attitudes and values of the people and therefore the problems associated with family planning are extraordinarily complex. "The adoption of small family pattern is inter-related with economic, social and psychological changes as well as with the development of facilities in the general area of family planning." It is, therefore, being increasingly felt that unless a multi-disciplinary approach is made in which geographers, demographers, sociologists, psychologists, economists, behavioral scientists and public-health workers cooperate, it would be difficult to achieve much success. As Agarwala¹⁶ observes "there is urgent need for developing a dialogue among various scientists working in the related fields of population programmes and

policies so that there is a sharing of common experience and the possibility of evolving an effective population policy."

Economy

India is one of the leading agricultural countries of the world, and one of the biggest sources of its wealth is its produce from land. There is hardly any crop of the tropical, sub-tropical or temperate zone which is not grown in this country. Nearly 70% of the workers depend upon agriculture for their livelihood, which accounts for nearly 46% of the national income. The net sown area is 45% (1964-65) of the total area of the country of which 15% is double-cropped; in contrast, the net cultivated area in Japan is 16% and in China 10-14% only. Cultivable waste is only 5.7% and comprises mostly of marginal lands. Thus, scope for extension of agriculture is highly limited and effort has to be directed rather towards its intensification. It may not be out of place to mention that of the total land area (326.8 million hectares), nearly one-fourth is affected by soil erosion, and two-thirds of our arable land need soil conservation measures.¹⁷

A favourable factor of climate is that temperatures throughout the year permit growth of crops. However, monsoonal rainfall with its attendant vagaries is not so favourable for agriculture and causes wide fluctuations in harvests from year to year. This brings home the necessity to harness the surface and ground water resources for irrigation. Due to efforts during the Plans, the annual usable flow utilization has increased from 17% in 1950-51 to 33% in 1965-66. Only about 20% of the ground water resources is utilized at present. Irrigated area has gone up from 20.73 million hectares in 1950-51 to 39.25 million hectares in 1964-65. Still only 31% of the area under food grains has assured water supply, 42% has uncertain water supply and 27% has practically no irrigation.

Along with water are associated the resources of fish both inland and marine, which can make significant contribution to food and nutrition. Considering the potential, the annual catch of about a million tons is too little and that too fluctuating.

S.C.E.R.T., West Bengal

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tuates seasonally and spatially with market-price fluctuations. Ware-house and modern storage facilities on cooperative basis will strengthen the fishing industry as has become possible in certain areas of the world like Hongkong.

As a result of increased use of water, fertilizer and modern techniques, agricultural production went up by 61.8% between 1951 and 1965. The index number of agricultural production moved up from 100 in 1949-50 to 157.6 in 1964-65, and that of food production from 100 to 149.1 (actual production: 89 million tons); today the food production is likely to reach 102 million tons (1969-70). Net sown area also increased from 119 million hectares to 138 million hectares during the same period. Indian agriculture is crop-oriented. Least developed are livestock, dairy and poultry farming as the seasonal character and limited area of natural vegetation, highly limited area under fodder, and small availability of other animal feeds provide inadequate proportions of nutrients in both quantity and quality. Nineteenths of the net sown area is devoted to food crops and 1/10th to commercial and other crops.

Agricultural regions of India are justifiably crop combination regions (Fig. 1. 10). Four macro-agricultural regions are distinguished, comprising of the Himalayan Zone (rainfall 100 cm to 250 cm), the Dry Zone (rainfall below 70 cm), Sub-Humid Zone (rainfall 70-125 cm) and the Wet Zone (rainfall more than 125 cm).¹² The leading crops are rice, wheat, millets, maize, gram, cotton, groundnut and cocoanut. Thus we have 8 regions of First order based on 1st ranking crops, 27 regions of Second order based on first 2 ranking crops and 48 regions of Third order based on first 3 ranking crops. In the Himalayan region, the main crops are wheat, maize, rice, and market gardening, particularly seed potato and fruits. In the Dry Agriculture Zone, the main crops are millets, oil seeds, wheat, gram, maize, groundnut and cotton. In the sub-Humid Zone, the main crops are wheat, sugarcane, rice, gram, maize, millets, cotton, groundnut, oilseeds and tobacco. In the Wet Zone, the main crops are rice, tea, oilseeds, jute, gram, millets, wheat, sugarcane, and spices.

There is a slow change in the cropping pattern. The percentage of food grains has marked a decrease from 76.7% to 74.8% in recent years. At the same time, area under sugarcane, groundnut, cotton, jute and fruits has marked an increase. Significantly, among foodgrains, percentage under wheat has increased. Net availability of food has ranged between 15.2 oz to 16.6 oz per day per capita. The population over the same period increased by more than 100 million. This and the rise in purchasing power have led to a sharp increase in demand. Consumption of better cereals like wheat and rice has increased. Between 1951-1965, nearly 55 million tons of food grains were imported at an annual average of 3.6 million tons.

Further increases of output to meet food demand can come through intensive agriculture by more widespread use of fertilizers and plant varieties which can absorb high dosages of inputs and multiply the yield. Under the Fourth Plan, it is hoped to bring more than 4.05 million hectares under *Tai-Chung* and other exotic varieties of rice and about 2.02 million hectares under new Mexican wheats. The target for nitrogen fertilizer use is 2.4 million tons (N) by 1970 as against 600,000 tons in 1965. After Independence, land legislation was introduced to disperse ownership as widely as possible, as one of the impulses of Indian nationalist movement was that tiller should be owner of the land. There are also 5,238 community development blocks each with about 20 technical and other personnel. Over considerable areas land consolidation schemes have been undertaken. Nearly 3,50,000 primary societies provide credit and marketing facilities to farmers although there is much scope for improvement in their working. Storage facilities have considerably increased since Independence, which have arrested the seasonal fluctuation of prices in market garden produce such as potato. With modernization of farming, a large programme for improvement of cattle and reduction in their number has been undertaken. Scrub-bulls are being castrated and a nation-wide network of artificial insemination centres has been established. Transport and power availability has led to considerable

regional improvement. With facility of assured water supply and required inputs, Indian agriculture is bound to show greater production and make Green Revolution a reality.

The mineral and power resources in India are considerable though not so abundant when we consider the area and the size of population. There are plentiful reserves of high grade iron ore, manganese, chromite, limestone and refractory materials (Fig. 1.9 inset). The reserves of all types of coal occurring in seams of one foot or more within depth of 2000' are estimated at 121,360 million tons. Workable coal reserves are fairly adequate, the present estimate being 81,600 million metric tons but coking coal (1,500 million metric tons) is not enough. India is the most important producer of block-mica in the world and her position in strategic minerals and chemicals is quite strong. She is much weaker in non-ferrous minerals except bauxite. The mineral wealth, by no means inconsiderable, encompasses a sufficient range of products necessary to make modern industrial development possible. The minerals of strategic and defence importance may be regarded as adequate though there is serious deficiency in some key minerals such as in those of tungsten, tin, mercury, sulphur and in petroleum. India's resources in highly strategic atomic minerals like uranium, thorium, zirconium, titanium etc are sufficient. Most important mining area is concentrated in South Bihar, S.W. Bengal and N. Orissa and adjoining areas of M. P. These together produce by value nearly three-fourths of the annual output of minerals in the country and this may rightly be called the *mineral belt of India*. The country has made considerable progress in exploration and production of mineral oil. Production in 1965-66 was about 5 million tons. There are 10 refineries of which 6 are in port centres and refine imported crude. Their total refining capacity estimated at 22 million tons by 1970-71, is adequate to meet the requirements of petroleum products.

India has only 15 million KW of installed-capacity of power resources including hydel and thermal. The country was a hundred times be-

hind U.S.A. and would have to increase its capacity very fast. Since 1951, when our great cycle of Five Year Plans was launched, electricity generated in India has grown from 2.3 million KW to 10.2 million KW in 1965-66. India has been doubling its capacity almost every 5 years. By 1970-71, the installed capacity is expected to rise to 20.0 million KW. This would include the development of hydro, thermal and nuclear power. The problem of seasonal fluctuation in hydro-power can be met with by erection of thermal power plants using low-grade coal. India has developed a number of multipurpose projects which contribute to power generation, irrigation and flood control. These are symbolic of developing India and are known as the 'Modern Temples of India'. The share of water power in electric generation has increased from 0.56 million KW (25%) out of a total of 2.3 million KW (1950) to 4.41 million KW (42%) out of 10.17 million KW in 1965-66. Accelerated growth of electric power is a pre-requisite for economic development, particularly industrial development. Industries consume 70% of the electric power. In pre-independent India, the location of electric power stations was demand-oriented. 50% of the thermal power generated was in Calcutta and 60% of the hydro-power supplied to Bombay city. Since Independence, large power stations are increasingly supply-oriented and are erected in the coal field areas or at natural gas and petroleum refining stations (Fig. 1.12). Regional power-grid systems are gradually developing in certain industrial areas in India. Large power stations play a significant role in region-formation. They constitute the basis for energy-intensive industries and electrification of the surrounding region. Electricity is the *sine qua non* for the advance of industry and rural economy alike and can help in the decentralization of industry.

India has adequate mineral, power, agricultural and human resources for industrial development. Yet India is industrially under-developed and is miles behind the advanced countries. This situation is mainly due to stagnation and impoverishment of India's economy during the British

rule. The competition of British machine-made goods led to the collapse of traditional industries and migration of artisans to seek livelihood from agriculture. Some of the agriculture was commercialized without the benefits of commerce accruing to the farmer; the frame-work of Indian Society was broken down which led to the loss of the old world without the gain of the new. Communications were geared to ports and defence. Development of irrigation, communications and industries was not in keeping with the needs. Only a few consumer industries existed and modern industry gave employment to only 2.4 million workers in 1947. The feudal land system crippled the farmer, and general poverty, lack of capital, lack of education, and the anti-development policy led to the crippling of general economic and industrial growth. India had a fairly advanced industrial structure before the advent of the British and Indian manufactures were in much demand in various parts of the world including Europe. When Alexander the Great retreated from India, he took with him a precious gift which was neither gold nor diamond but it was a gift of 30 pounds of high quality iron from King Porus. This is only one of the examples of India's earlier industrial development.

However, planned efforts for development were initiated after Independence. In the First Plan, agriculture was accorded priority but in the Second Plan emphasis was placed on the development of basic and heavy industries to speed up industrialization. State enterprise has principally confined itself to heavy and strategic industries. The index number of industrial production has risen from 100 in 1956 to 181.6 in 1965-66 and is estimated to rise to 306 in 1970-71. There has been a significant growth and diversification of industries. Iron and steel, heavy engineering, chemical and electrical industries were developed and India became independent to a considerable extent of imports in certain items, such as kerosene oil and other petroleum products, drugs and pharmaceuticals, dye-stuffs, caustic soda and soda ash, plastics, paper and paper board, aluminium, textile machinery, machine tools, sugar machinery, special steel, zinc, steel and

metallurgical and mining equipment. She is in a position to export certain manufactures like engineering goods—fans, sewing machines etc., electric and electronic equipment, iron and steel, metal and metal manufactures, chemicals, soap, rubber manufactures, perfumes, drugs and medicines. The chemical, metallurgical and engineering industries have grown at a faster rate than the old industries like cotton textiles, jute manufactures, sugar and tea. In addition, ancillary small scale industries provide employment to large numbers.

These developments have not caused, however, any major shifts in industrial pattern but some diversification and dispersion is discernible. Calcutta-Hooghly side and Bombay-Ahmedabad still dominate. NE Peninsular region, particularly in the Damodar Valley, Bihar-Orissa tract and Eastern M.P., has emerged as an important area for heavy industry. The steel belt is becoming well-defined. For balanced regional development, some public-sector plants have been located in under-developed areas. They are the new steel plants at Durgapur, Rourkela and Bhilai, fertilizer plants at Namrup, Gorakhpur and Nangal, Diesel Locomotive Plant at Varanasi, (Fig. 1.11), heavy electrical plant at Bhopal and Hardwar antibiotics at Rishikesh, HAL, ITI and HMT at Bangalore, Integral Coach Factory at Perambur (Madras), Hindustan Ship-building Yard at Vishakhapatnam and several other plants in various parts. Further, in consumer goods and light industries, dispersion has taken place. This is marked in sugar, cement, light engineering, textiles and paper. The use of new materials and techniques has further led to dispersal. The Government is also keen on rural industrial development and is encouraging the establishment of rural industrial estates.

For rapid economic development in India, *transport* forms one of the chief components, the others being irrigation and electricity. Main railway lines were laid from major ports to interior parts but interlinks remained weak. Different gauges hampered free development and road network grew without much coordination with railways.

As a part of planned national economy, 'the transport system has now to serve wider range of purposes and has to play a vital role in economic, social and technical development at national and regional level as well as in the expansion of international trade'.¹⁹ Therefore, steps are being taken to correct the defects of inherited transport system and further develop it to suit our needs. There has been big increase and speeding up in the movement of people and goods. Former backward and isolated areas have been opened up. There are today 9 railway zones (Fig. 1.13 inset) having in all 28,570 km of broad gauge, 25,522 km of meter gauge and 4,305 km of narrow gauge railway line, (Fig. 1.13). Passengers carried in 1964-65 were 2,014 million and freight was 195.1 million metric tons.

In 1966, there were 263,316 km of surfaced and 532,839 km of unsurfaced roads. A number of National Highways (38,623 km) have been developed to facilitate country-wide movement by roads linking Delhi with state capitals, major ports and foreign highways (Fig. 1.14). This development has also encouraged the through movement of goods by trucks in a fairly well-organised manner leading to the partial diversion of traffic from the railways. An International Highway is also in the offing traversing the Great Plains, from Europe to Bangkok and Singapore.

By air, India is considerably well served both internally and externally (Fig. 1.14 inset.) Air India is operating long distance international air services and Indian Airlines Corporation is operating services within India and to adjacent countries. The Civil Aviation Department maintains and operates 84 aerodromes including 3 international airports at Bombay (Santa Cruz), Calcutta (Dum Dum) and Delhi (Palam).

In addition, there is a wide network of post and telegraph offices. On 31st March, 1967, there were 68,874 permanent post offices and 13,019 telegraph offices. The number of telephones was 932,908 in the same year. For the long coastline of the country and needs of the trade, India has yet to develop adequate shipping facilities. On 31st July, 1966, there were 228

ships totalling 1,664, 728 GRT; of these 99 ships were engaged in coastal trade and 129 ships in overseas trade. The major ports are Calcutta, Bombay, Madras, Cochin, Marmagao, Vishakhapatnam and Kandla which handled in 1964-65, 27,640 million tons of imports and 2,670 million tons of exports. India has at present only one ship yard at Vishakhapatnam capable of building sea-going cargo vessels. Two more ship yards (at Bombay and at Calcutta) can build sea vessels of smaller tonnage. A ship yard is being built at Cochin for the construction of bulk carriers and tankers.

According to Ashok Mitra²⁰, *levels of regional economic development* are divided into 4 categories (Fig. 1.15) taking into consideration general ecology, agriculture, infrastructure, participation rates in traditional sector, potential of human resources, distributive trade, manufacturing and organized industrial activity in modern sector. The picture that emerges is one of pockets and zones of backwardness invariably enclosed by areas of prosperity or spread-effect. Human attitude and endeavour have surged ahead of economic development in Kerala and Punjab and lagged behind in Gujarat, Eastern U.P., NW Bihar and NE Madhya Pradesh which "in spite of its long history of migratory labour bringing in and out tidings of the winds of change for more than a century, still is at a low level". Amongst economically depressed areas special mention may be made of East U.P. in the Middle Ganga Plain and Rayalaseema in Andhra Pradesh.

When we consider the two aspects of population and economy, we feel that while planned economy should grow rapidly and at a rate faster than population growth, efforts should be made to control the population growth. The problems are vast and complicated but united determined efforts must be made at all levels to make life meaningful and happy. Such efforts, are on way, however their way-weak they may appear now. Here is both an opportunity and a challenge to participate in this task of national development. Political turmoil with the social backlog appears to have prolonged the period of transition in economic development. We are witnessing

transition from primitive and feudal to modern. Here we see the diversification of skills and redeployment of faculties which in the past achieved the finest in art, music, religion, human invention and technology. Economic development is being adopted as an instrument of social change which in turn is bringing about equality of opportunity and accelerating economic growth, smoothly and silently while human values are preserved.

Regionalization of India

General Regional Method

Regional approach in geographic studies has been long regarded as 'inherently geographic' or rather the focal concept of all geographic work.²¹ It focusses on a particular area of the earth and studies it through the whole gamut of geographical factors—physical, biotic and human (both visible and invisible or institutional)—which working in unison and intersecting among themselves and with other areas over a long period of time provide relative homogeneity or a distinctive character to it from the neighbouring areas. The central theme is not what Hartshorne decries as the phenomenology of the landscape nor is it much concerned with the distribution of the various individual phenomena—its main concern is with the systematic study of the synthetic results and expressions of the various phenomena areally or spatially related and interconnected in a particular region and leading to its homogeneity, although it is quite possible that some of the factors may not be causally related. Hettner, Whittlesey and other regionalists hold this view when they discuss the relevance of various phenomena or their distributions to geographic studies. Regional geography has been regarded by its most devoted protagonists to be concerned with the derivations or determination and analysis of "the co-variants of areal distributions on the surface of the earth." Regions are determined and further divided into individual units according to the degree of correspondence or homogeneity of the various geographical phenomena or "areal variables". Many German regional geographers define 'region' in terms of a distinctive physiognomic

(formal) and physiological (functional) similarity or homogeneity which results from a distinctive assembly of "spatially arranged things".²²

The term 'region' is nebulous in character : the very concept, purpose and method of study and the size and shape of the region etc. vary. To that extent also, then, the "delimitation of a region is always based on a mental judgement"—it has been regarded indeed as a subjectively conceived idea screened through either subjectively or even instinctively chosen defining criteria or through objective analysis of the variables or, more often, by a combination of the two sets of factors. The chief criticism levelled against the concept of region arises out of its incapability of being defined through a standard definition and stand to objective analysis—"the concept of region floats away when one tries to grasp it, and disappears when one looks directly at it, and tries to focus".²³ The regionalists have so far failed to set standard definition or any objective method and criteria to delimit regions, facts which are *sine qua non* for any scientific study. Systematic geography, in contrast, is worthy of objective analysis. However, the methodologists, as the critics of the regionalists are referred to, "who so far have largely criticised the rough and inaccurate methods" of the latter have yet to provide a master key for regional analysis.²⁴

Two views have been brought forth so far in terms of the regional concept : first is that the regional method is a means to an end, which strangely contrasts with the second, that is, rather the older regional concept, that "regions actually exist "in nature as objective facts—one could, as it were, discern them. The first view is more purposive and prevalent these days. In fact, the method provides a device for selecting and studying areal groupings of the complex phenomena found on the earth". Some authors in the past and even recently laboured on regional division and 'region-hunting' became an end in itself.

The former concept has, however, prevailed, and has served to fill-in the gap of dualism that was widening between the 'topical' (general or systematic) geography on the one hand and the re-

gional studies, on the other. Whittlesey has emphasized the mutually benefiting role of the two fields : "the study of topical field in geography involves the identification of areas of homogeneity, which is the regional approach; the study of regions that are homogeneous in terms of specific criteria makes use of the topical approach because the defining criteria are 'topical'."²⁵

Systematic geography is more exact, logical, exhaustive and comprehensible, and its regions can be more objectively and technically defined, and the criteria comparatively easily standardized and applied elsewhere. Regional geography, in contrast, is not prone to that level of objectivity, standardization and precision, but all the same, it has its own field, own methods and own approaches. In fact, to most geographers, the two branches of geography are complementary, and could be "even more complementary, even more useful as two different tools which will do different parts of one job, if the differences between their aims and capabilities are further emphasized and clearly defined."²⁶

The procedures and approaches of the regional method, however, are different from those of the systematic geography. This method discovers and analyzes the various geographical components and factors and their associations and interactions in a discrete area, judges its homogeneity, delineates boundary and discovers its individuality and personality. This results into a synthesis of the region as a result of the complex association of features. Such area is then a 'formal' or 'uniform' region as distinct from the 'nodal' or functional region or even *a-priori* region.

For Wooldridge and East, "the purpose of Regional geography is simply the better understanding for a complex whole by the study of its constituent parts". As such, the study of the distinguishable parts and their associated environments is the best tool for the understanding of the wholeness of a country or a region. When C. C. Carter is calling the regions as "good servants (and) bad masters", he perhaps means that they are not ends in themselves, but can serve well as tools for comprehensive study. For Spate, likewise, the regions offer good 'isolates'

for study.²⁷ Even if the earth's surface, as according to some, is a continuum as perhaps 'nature abhors lines and boundaries', which humans, and most certainly geographers, seem 'to adore' and make all-out attempts to find them, it is the human interactions with the physical factors, and more among themselves, which add distinctive traits and characters to the natural continuum, and it is these superimposed characters which offer boundaries, recognized instinctively or objectively by geographers. It is because of this that even though the region is not capable of easy or standard definition, the concept of region is 'capable of growth and adaptation' for various human objectives.

The regional geography is subject to constant interpretation and revision of its objectives. Definitions have varied accordingly from W. I. G. Joerg's "An area whose physical conditions are homogeneous" to K. Youngs' "A geographic area unified culturally, unified at first economically and later by consensus of thought, education, recreation etc., which distinguishes it from other areas."²⁸

The frontiers of regional geography have now "moved from a nature-dominated regional geography to one dominated by Man". What we have come to refer to as the probabilistic regional geography, depending now on a multi-variate analysis of factors, relates Nature to stochastic human processes. From a mere description of regions dominated by 'what' and 'when', the study has moved to a systematic analysis to 'why' and 'how' stage. The aim is now to analyse the region in terms of the optimum use of regional resources, physical, biotic, and human including institutional, based on a political and socio-economic rationale within a general stochastic framework. Rather on a different plane and based on a highly revolutionary political ideology, the dialectic materialists have moved the frontier of regional geography to the voluntarist approach, which has led to the delineation and formation of regional complexes as in Russia and China by envisaging man-in-society in complete "charge of Nature."²⁹

Descriptive regional studies have produced

some fascinating works where the authors have chosen, according to their own purpose and 'mental judgement', various criteria to mark and delineate the regional boundaries. Description has now been replaced by explanatory regional studies which are now taking more and more variables with a view to approaching more concrete and precise results and are also bringing in new hierarchies for fuller comprehension of the personality of the region. Co-variance analyses of various sets of features within a given region are providing fruitful results. For more objective and precise delineations, more sophisticated mathematical-statistical tools are being devised and adopted.

However, the mathematical approach of regional science had laid emphasis more on regional models, which do not offer suitable alternatives to subjectively worked out schemes, and which are, more often "at best ungainly caricatures of the real world". As Mathieson further puts it, it is subject to "argument as to the value of a geography that requires cybernetics and computers to solve real world problems."³⁰ Perhaps, 'understanding' cannot be replaced in regional delineation schemes by mathematical models, yet adequate emphasis should be given to quantitative analysis of geographical factors and extent of their associations in given areas.

Another trend that is being discussed and even followed by some is that even in to-day's man-dominated world, the regional monographs are biased towards the 'physical base' and start in the 'traditional' or 'conventional' fashion with geology-structure-climate-soil-natural vegetation and then cultural features *ad seriatim*, seemingly as if the one causes and patterns the other phenomenon.³¹ Perhaps, as Minshull puts it, there is in the authors' minds some sub-conscious conditioning of relief and physiography as the latter are tangible, relatively static, and perhaps clearly defined units. If physical factors are important at certain orders or levels of regions, so also are human factors. Wooldridge has observed that man is "worthy at least to rank with tectonic forces, erosion processes, climatic conditions and the rest", and his occupancy has given more

pervasive landscape features. Man's works, more subtly than what is generally supposed, accentuate the distinctiveness of the personality of the regions. It is true that most of the modern regional monographs follow 'conventional' arrangement of factors merely to give a balanced regional account and are not usually plagued by determinism, neither do they wish the human factors to play second to the 'physical base'.

However, some writers have started initiating the regional treatment with the human ensembles. Demangean is one for such treatment as for him the formal farming regions are important 'ensembles' of landscape. Similarly, population, that important index or ensemble of all the physical and human factors, could be an important item to begin with and then one could work backward and forward with different physical and cultural factors. Vidal de la Blache actually did this, but he has been almost alone so far. However, it may be desired to begin the regional synthesis of more humanised regions from cultural factors and trace out toward the physical factors.

Hierarchy is inherent in regional study and is a direct result of the use of regional method to comprehending the whole by studying its parts. As stated above, the region varies in size—it may be a continent, a country or a district which can be regarded as a whole or can be shared with a greater whole, of which the smallest region is a part. Although subject to criticism on these counts, it is implied that the regions "can be of any size according to the intensity of the study", and the generalisations sought, and the "criteria for such sub-divisions will depend upon the physical or cultural features that are considered pertinent to the purpose for which the regions are being sought". In regional studies, the ideas of size, shape and function are combined to devise a hierarchy; at each higher level the region is larger, more complicated and more generalised as to the association of the various regionalising factors.

Hierarchy of regions has been achieved both by working downwards from the world, continent or other large region to begin with, or up-

wards from the smallest possible unit. The ranks, however, arrived at various levels, may not necessarily be the same in the two processes. Need and significance of hierarchy of regions were felt in Germany very early, almost about two hundred years ago and German scholars have been working on it since then, although with different purposes and criteria, mainly based on physical factors.³² S. Passarge and others have contributed much to this field. Working from the smallest unit, *gend*, usually of uniform relief, they achieved *Landschaftsteil* by combining gends. Further combinations of *Landschaftsteils* resulted into *Landschaft*, a region with distinctive physiognomy and distinctive personality based on the association of 'spatially arranged phenomena'. *Lansteil* was the further larger unit, the combinations of which resulted into the land, a large region to incorporate in general all the physical factors. The hierarchy was taken up to the division of the world, the generic units of which, similar to Herbertson's 'natural areas' were termed 'regional girdles' (*Landschaftsgürtel*) on the basis of certain world-wide criteria. Penck also worked on hierarchy, his smallest unit termed as 'chores' and further combined to form rather the much larger unit, the *Landsgestalt*. Troll also worked out typological schemes, first on the basis of physical factors and later, and rather independently, on social or cultural factors. Most of these schemes, being based on physical factors alone, could not be taken for regional studies.

Unstead worked out a scheme, inspired by Herbertson's notion of 'tissues' and 'cells' and recognised such unit areas as 'stow', 'tract', etc. Linton's hierarchy is also famous. Based on landform or relief and morphology and working from below upwards synthetically, like Unstead, he recognized such units and further associational areas as the 'site', 'stow', 'tract' (similar to French 'Pays'), 'section', 'province' and 'major' or continental division. He argued that synthetic method is preferable to the analytical or dissectional method, as by working downwards one ends up with 'major' division, 'provinces' and 'sections' only and can go no fur-

ther down, using the same criteria. This approach may be appropriate for a large continent or country but not for a small region. His concept of 'site', the smallest unit with uniform surface, has been recognised to be useful, like Troll's 'ecotype', by workers in the field of ecology, agronomy, landuse, vegetation, pedology, microclimatology and farming. His scheme is worthy of note also because he used different criteria for different hierarchical levels—his 'stow' having 'unity' by repetition of similar 'sites' the 'tract', 'unity of form', and the 'section', 'unity of erosion history'. Further up he is vague, and just proceeds by way of convenient process of combination. His scheme has also relevance to the factors of such complex phenomena as farming and can be even used by geographers as a basis.³³ At present most of regional works and monographs divide the regions in different-order units and sub-units, although no standard hierarchical scheme is followed.

Previous Considerations in Indian Regionalization

Serious and rather professional attempts for the regionalization of India are quite recent, almost a matter of the inter-war period to begin with, although it is obvious that India offers a very clear-cut macro-level division. Single feature or even multiple feature regions were carved out by many workers and organizations but most of these works were attempts for some specific purposes and they do not seem to have given much cognisance to the geographical factors which unite or diversify the country. Regions brought out by the Meteorological Department of India on the basis of a single feature such as temperature, pressure, rainfall, or even some composite features of climate in general, or maps of regions for census purposes prepared by the Census Department, have been of limited value for geographers, interested in the recognition of the regional framework of the country. Perhaps the earliest scheme of broad regional division was prepared by McFarlane in his volume: *Economic Geography*. More substantive and well-known work was, however, produced by Stamp

who drew up a working scheme of the division of India during 1922-24 and which he used in several geography text books including that of *Asia : A Regional and Economic Geography*²¹. Almost simultaneously but independently of Stamp's scheme was one proposed by Baker who incorporated some unpublished ideas of W. Arden Wood. Although independently drawn, the two schemes of Stamp and Baker are in close agreement on the broad regional divisions and also in most cases on the regional boundaries.

The factors adopted in the delineation of regions produced by Stamp are "primarily phytogeography and structure and secondly climate." There are three primary or macro-level regions and twenty-two sub-regions worked out for the whole of India. Stamp designates these regions as "Natural Regions". The three macro-level groups of natural regions of the country are :

- (a) The natural regions of the Mountain Wall;
- (b) The natural regions of the Northern Plain; and
- (c) The natural regions of the Indian Plateau.

The "Mountain Wall" that falls within the present boundary was divided into four sub-regions—(1) The Eastern Hill Region or the North-East Hills; (2) the Himalayan Region comprising the Himalaya Mountain chain approximately from 15,000m upwards; (3) the sub-Himalayan Region comprising the foot-hills between the plain and the mountains as well as the lower slopes of the Himalaya themselves; and (4) The Tibetan plateau covering Aksai Chin area and other parts falling within the Jammu and Kashmir boundaries. The basis of this delineation is primarily climate and partly elevation.

Similarly the sub-division of the great alluvial plain of Northern India is based on climatic variations. Stamp recognises this distinction between the older alluvium of the Punjab and the U. P. and the younger alluvium of the deltas, yet the resulting regional differences are but slight when compared with the regional variations produced by climate, hence the dominant role of climate as a factor in regional sub-division. The North Indian Plain falling into India's borders partly or exclusively are (8) The Punjab

Plains (Indo-Gangetic Plain West); (9) The Upper Gangetic Plain with an annual rainfall of 100 cm and comprising two-thirds of the U. P.; (10) The Middle Ganges Plain—an intermediate region with a mixture of wet zone and dry zone crops. Baker has linked the upper and middle Ganga plains and has named the division as Indo-Gangetic Plain East; (11) The Lower Ganges Plain or the delta region—the wet region of newer alluvium corresponding roughly with the former province of Bengal and now divided into West Bengal within India and East Bengal of East Pakistan; (12) the Brahmaputra valley (Assam valley)—a region of heavy rainfall like the deltas.

For the entire region south of the Northern Plain, Stamp has preferred the term Indian Plateau to the other two terms of use, the Peninsular India and the Deccan. He observes that the term Peninsular India is or be reserved for the land south of the Satpura Range while "it is unwise to refer to the Deccan without qualification because of the multiplicity of meanings given to that name." The sub-divisions of the Indian Plateau running from numbers 13 to 22 are grouped into three main heads :—

- (a) Coastal Region around the Plateau proper covering no. 13 (Kutch, Kathiawar and Gujarat), forming a transition between the dry Indus valley and Thar Desert on the one hand and very humid West Coast on the other; no. 14 (the West Coast region) lying between the crest of the Western Ghats and the Arabian Sea comprising a narrow coastal plain and the slopes of the Western Ghats; no. 15 (the Karnatak or Tamil region), also referred to as the East Coast South encompassing a broad coastal plain and an inland hilly tract; and no. 16 (the Northern Circars Region, including Orissa and also referred to as the East Coast North) lying between the Eastern Ghats and the Bay of Bengal;
- (b) the Plateau (Peninsular India Proper) comprising sub-regions no. 17 (the Deccan Region, using the term Deccan in its strict sense), covering the high southern portion of the Plateau; no. 18 (the Deccan Lavas Region) in the north-western portion of the Plateau corresponding with the Black Cotton Area; no. 19 (the North-East part

of the Plateau) being a complex region and comprising five further sub-divisions—the Central Indian Highlands, Chotanagpur Plateau, Eastern Ghats, Chhattisgarh Plain or Mahanadi valley and the Godavari valley; and (c) Regions north of the Satpura Mountain line and sloping down towards the Northern Plain, forming sub-regions no. 20 (the Central Indian Foreland lying between the Ganges Plain and the Narbada-Son trough); no. 21 (the Rajput Upland Region) a complex region of hills and plateaus between the Vindhya in the south and the Aravalli Hills in the north-west, and no. 22 (the Thar or Great Indian Desert).

Stamp's work held importance for a long time, and is still regarded valuable for broad divisions of India. The three macro-level regions of the country, in fact, suggest themselves from any point of view that they are the most convenient major units, well established and easily comprehensible and perceptible from the viewpoint of physical or cultural factors or a miscegenation of the two sets of factors. There is much scope and a case, however, for the fourth division, i.e., the Indian Coasts and Islands to be marked as a separate division, as was stated by Kazi S. Ahmad later, but with arguments not well grounded.

It was towards the end of the 1930's that some other workers felt the need for a more rigorous regionalization of India.³⁸ Pithawala published a work on the regional division in the journal of Madras Geographical Association in 1939; he also added a critique to the schemes proposed by Baker and Stamp. Pithawala adopted the factor of physiographic uniformity as a master principle running throughout the hierarchy of regional divisions. As Spate has observed, Pithawala's text and the accompanying map are not always consistent. There are also some other discrepancies, particularly arising out of his inflexible one-principle, or one-factor delineations of regions. One master-principle, however logically controlled and rigorously maintained, simply cannot work as a device for the regionalization of a large country like India, much less for the lower-than-macro-level sub-divisions. It is rather an unattainable goal. Pithawala's

boundaries in the plains, as for example, between the Indus and Ganga plains, seem to be very confused and he has neglected the obvious fact that as the plains run almost endlessly featureless and monotonous, they defy regional division on any meaningful boundaries and more so, on the basis of physiography. Boundaries in the plains must be worked out on the bases of more substantive and composite set of factors.

Being put to criticism by Kazi S. Ahmad and some others, Pithawala revised his scheme and also attempted to meet some of the objections, yet he could not modify his adherence to the fundamental guide, the physiography principle. Although the logic of regionalization or division claims that "the division should proceed at every stage and as far as possible, throughout the division, upon one principle"; this principle obviously fails to operate in the scheme of regional divisions of India, as also for other similar regions, because of the vast size and large physical dimensions, and considerable physical diversity, further accentuated by a very complex cultural heterogeneity. For such a complex region, however, the principle of using more important properties of division in the higher categories than those in the lower categories seems to be more logical and operationally helpful. Truly, then, the principle of "use of more than one differentiating characteristic or principle of division" has to be adopted to produce a meaningful hierarchy of regions.

Kazi S. Ahmad brought forth four macro-level divisions of India, separating the Coastal Plains from the Indian Plateau. As stated by Spate, Ahmad's division is quite sound, but as Pithawala criticized him, its lack of any suitable hierarchical order, particularly in view of the country's vast dimension and scale, is lamentable. His ranking of the great "undifferentiated mass of the Himalayas" and the small sub-montane *Chh* area of the Punjab on an equal footing does not bear any logic to the scale of the divisional scheme. It is certainly an example of "local knowledge getting out of hand".

Typically, on the still live issue of the three or four unit macro-level divisions of India, Ahmad

and Pithawala differ widely and so also does Spate. Ahmad's plank in separating the Coastal plains from the Deccan region and thus providing a four-unit division is that geologically the three-unit division could be possible but relief and physiography suggest four-unit division, while Pithawala holds that the Coastal lowlands are mere "shore facies" of the Deccan Trap and southern plateau provinces. Spate, evaluating Ahmad's view on the whole as "less unrealistic" than that of Pithawala, is, however, highly critical of the former's four-unit division; the basis of his criticism is, however, untenable. He observes that if at all any departure from the standard three-fold division has to be made, "there are not three or four grand divisions but five, since En (eastern) and Wn (western) littorals differ in almost every respect, including relief and structure". This is rather an extreme view of things, held on the face of Spate's own statement: "there is obviously no end to this sort of fission". What seems important here is not the details of the two coasts differentiating them from each other but rather the more obvious fact that the coastal lowlands are basically different from the inner, vast Plateau complex, if we have any regard to the human factors and cultural landscape, if not relief and drainage alone, and at the top of all, they wear a sizeable dimension too on macro-scale, forming continuous rim of the Peninsular Uplands.

Spate is, however, correct in criticizing and rather rejecting Pithawala's high-flown claim of precision having been reached in the regional division on the basis of all-the-way-running one-criterion logic, that is what his physiography principle is. Pithawala claims "Over such scientific and logical divisions of the country, all matters relating to climate, natural vegetation and even human settlements must drape themselves completely and to the satisfaction of all other advocates of allied sciences." It is really a very tall and exaggerated claim; it is rather naive to think of such 'draping' of factors including cultural factors around physiography—it smacks of highly deterministic views. Pithawala seems to try to explain regional variations

in "the totality of things seen on the earth's surface" and assumes that the physical environment and human-cultural processes co-vary spatially "because human activities are controlled principally by physical environment."

Spate's division of India is more detailed and refined than other works produced so far. He is in general agreement with the schemes of Baker and Stamp and is highly critical of Pithawala's physiography-controlled scheme or Ahmad's work of four-unit major divisions and lack of hierarchy. He observes, quite rightly, that unless very serious and detailed regional studies are taken up and regional monographs produced on some such line as followed by Unstead, "any serious division at this stage, therefore, cannot be more than a reconnaissance". Spate is also sensitive to the difficulties in regionalizing as complex and vast a country as India and agrees with Jones and Bryan's statement that "though.....regions exist, it by no means follows that a whole continent can be divided into well-marked areas", and he lays bare the fact that in such schemes there may be scope of left-overs, as has indeed been the case of the Upper Mahanadi basin in his scheme "when more definite units have been sieved out". Structure has been the most recurring factor in his scheme, yet the division cannot be exclusively based on any one touchstone. He endorses Kuriyan's view that "understanding is more important than classification" in India.

Spate has divided the sub-continent into three 'paramount' macro-level regions, based primarily on structure. He is more liberal in choosing the criteria in further sub-divisions. He does not decry amalgam of factors in practising regionalization. As a matter of working convenience, certain regional groupings—essentially positional or even political—are adopted "bringing the treatment of regions belonging to two or even three of the primary divisions into juxtaposition".... The hills of Assam are treated, for example, with the plains, to save "repetition and cross-reference". Spate observes that "after all, regions are so juxtaposed in nature on the map, and in human activity"—this statement refers to the

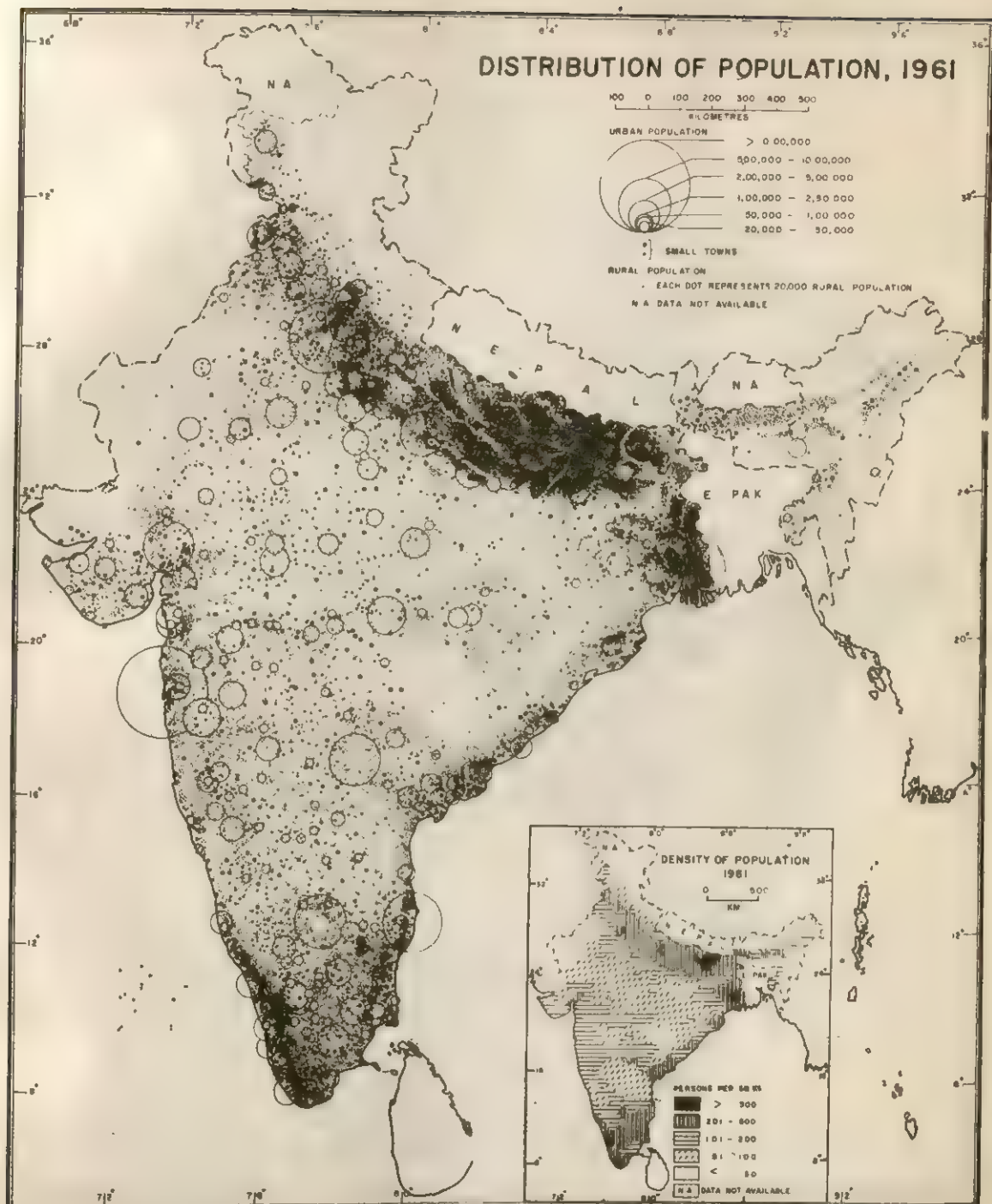


FIG 18

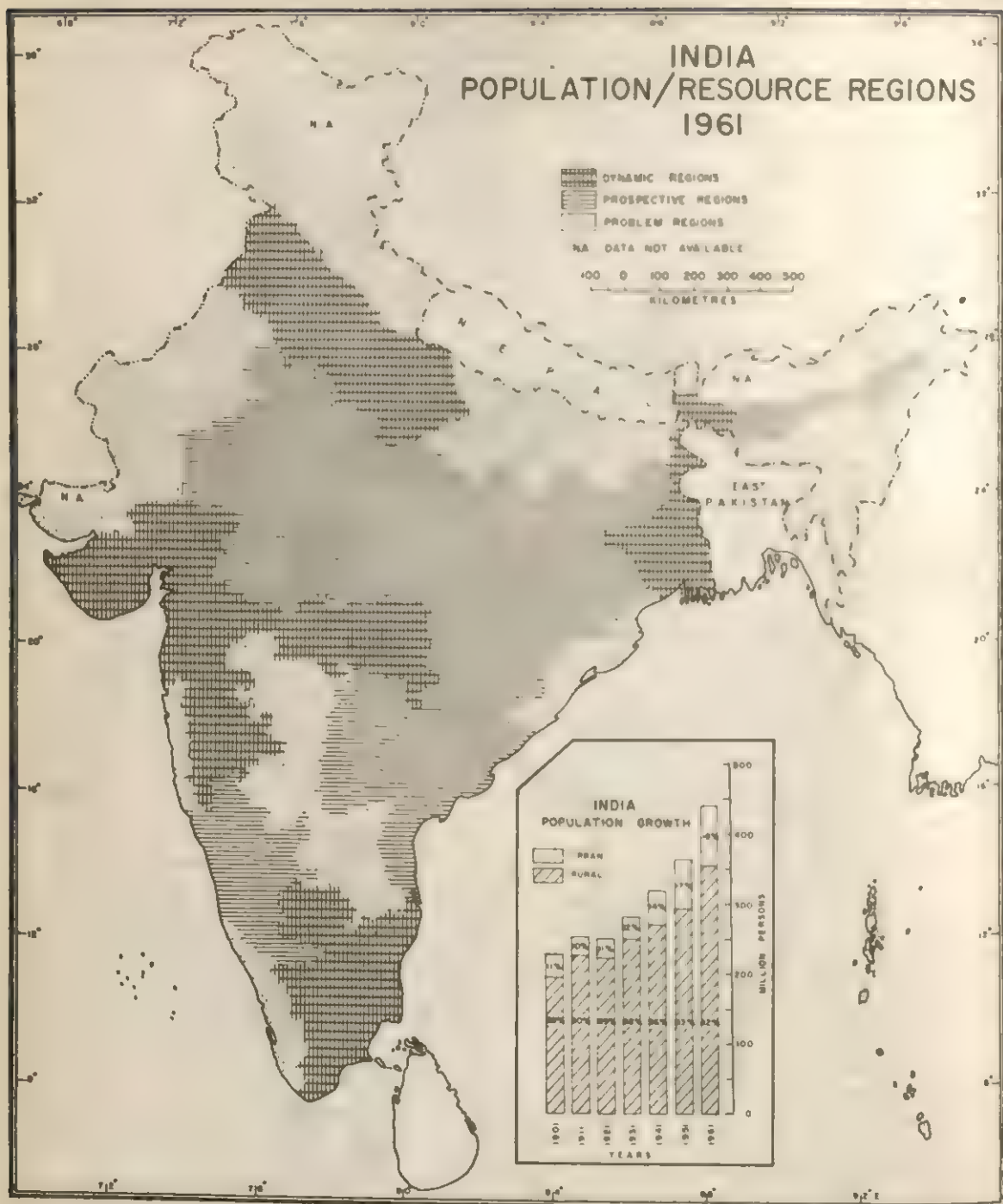


FIG 19

CROP COMBINATION REGIONS

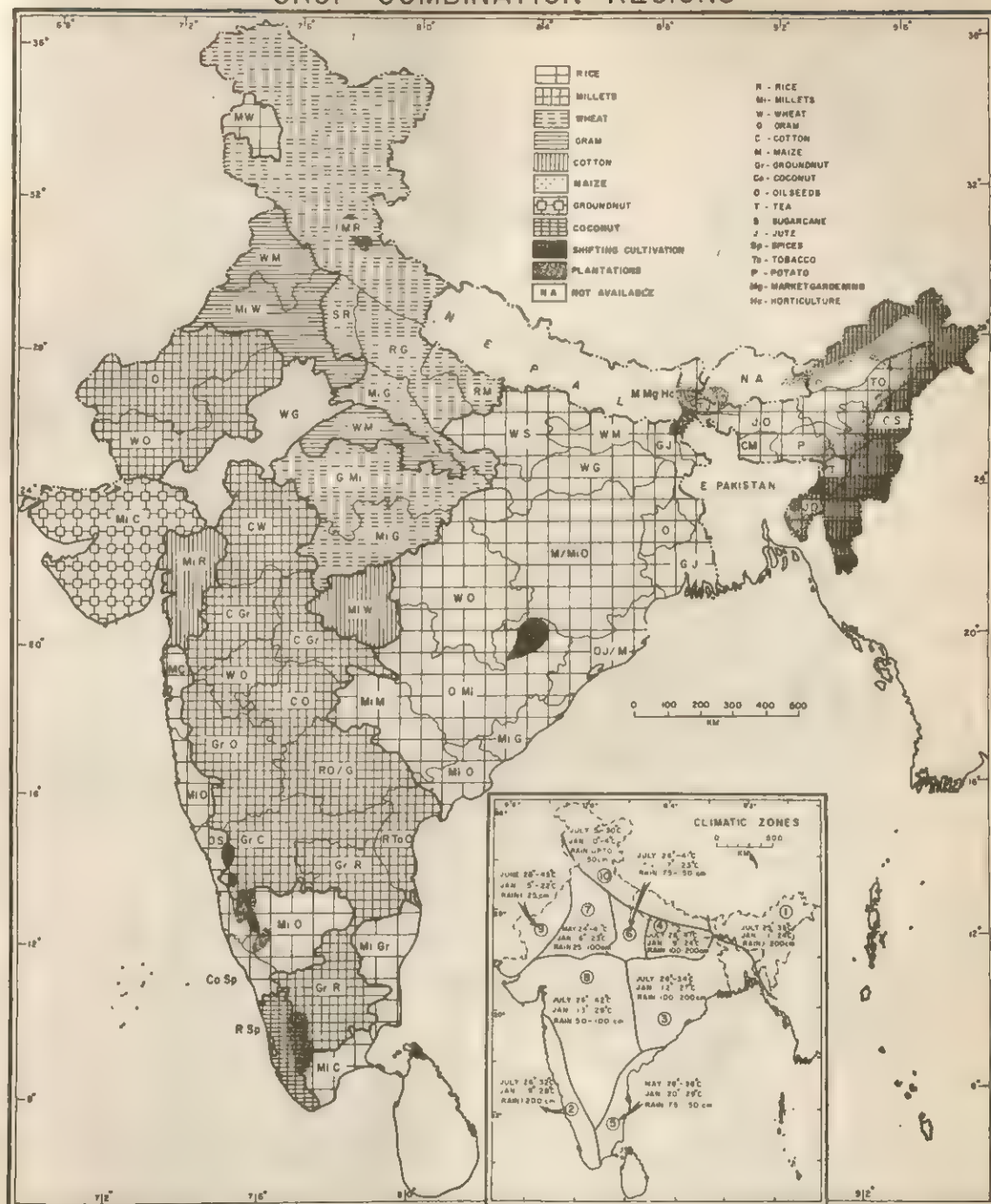


FIG. 10 - INSET 1, PER HUMID NORTH EAST, 2, HUMID SAHYADRI AND WEST COAST, 3, HUMID SOUTH EAST, 4, SUB HUMID TRANSITION, 5, SUB-HUMID LITTORALS, 6, SUB HUMID CONTINENTAL, 7, SEMI ARID SUB-TROPICAL, 8, SEMI-ARID TROPICAL, 9, ARID, 10, WEST HIMALAYAN.

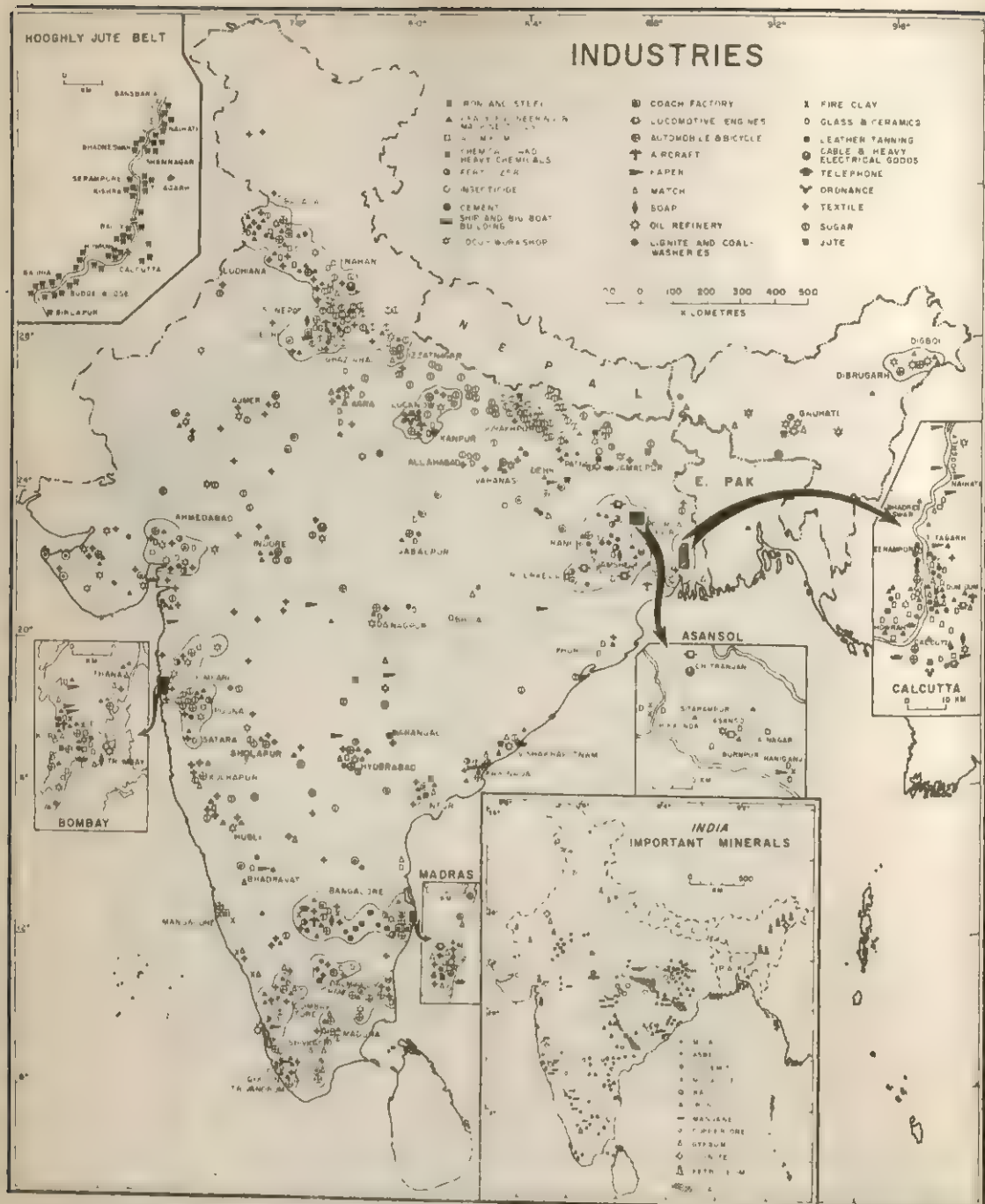


FIG III

consummate skill of a regionalist working on regionalization with a view to an end and purpose.

Spate's tentative scheme of division is empirically derived, "having been arrived at in the actual process of writing the regional descriptions". He has brought forth 35 regions of the first order (under the three macro-regions excluding islands), 74 of the second order with about 225 sub-divisions. His view regarding regionalization is very flexible and dynamic; he is sensitive to the fact that "many regions and sub-regions might be further divided" on the basis of more detailed and closer studies and sharpened techniques. His hierarchy is mindful of the scale and its possible variations "since a ridge which might rank as a sub-region in the Peninsula would be hardly more than a feature in the Himalayas; variations in geomorphological texture and intensity of human activity compel variations of scale".

The Regional Approach

India is a vast and humanly too complex a country for any facile generalization or comprehension to be meaningful, and it is difficult to grasp it and to understand it in its entirety; hence the need and scope for its regionalization, and yet the problem remains whether the dictum that the whole can be understood through its parts, holds good for India. Moreover, the task of regional division is a difficult and challenging one, and yet it is vastly rewarding because it is the surer way of investigating into and finding out the really significant aspects of the geography of the country. Political units or divisions do not carry us far because these units have essentially been created, recreated, miscegenated together or torn asunder according to the administrative convenience; and more often than not they were cast for political control rather than for administrative efficiency, which demands a more pragmatic and scientific organization of space. Some attempts have been made, as in American regional monographs, to use states or groups of states to be taken for regions. Although there is some justification in this approach from the point of view of statistics, which help in the preparation of regional plans, this trend may carry

us astray from the geographical realities. Some of the Indian States and Territories are too large or too small or too heterogeneous or too much otherwise to be taken for geographic regions; in fact, more often they are found to be "anachronistic and irrational, blurring rather than heightening the reality of human regions". The linguistic states, supposed to co-vary with the cultural sub-units of India, and meeting the political aspirations and realities, are foundering on the bed-rock of economic realities before they could crystallize themselves into viable units. In the making of these units or during the course of their reorganization, the region-forming geographic factors had been ignored. Yet, the present study, as will be seen in the sequel, has tried to accept such political or administrative regions where they can geographically serve well, particularly in the task of delineating the lower levels of the regional hierarchy.

The review of the various attempts for dividing India into suitable regions for study shows that even the macro-level division is not simple and breeds difference of opinion among the authors, though all face the problem with the same objective. At least there is no master principle to be adopted, and convenience and understanding seem to be playing a more dominant role than is warranted in a scientific study. As is quite natural, there is no agreement, except occasionally, on both the set of criteria for the delineation of the regions of various orders or on the number and size of regions. Admittedly, there is some point in paying attention to the statement that "the world and each small part of it is unique", and hence the criteria of regionalization, and the number and size of regions, will vary accordingly with the regions, as also with the objective with which to proceed on to the task of regionalization. For regionalizing such a complex country as India, the criteria have to be multifactorial and even divergent at the same level of hierarchy. This is because all the distinguishing factors could not be of equal importance, and much less for all regions; also the homogeneity of a region, i.e., its distinctiveness from other regions, will be determined by only certain of the

factors or a particular group of associated factors, while some other set or association from amongst the same factors will be offering the key for other neighbouring regions. This complexity in India arises not as much because of the fact of its large size, varied structure or topography, climate, vegetation, soil or other physical or positional factors discussed in the foregoing, as because of the levels and types of interactions of human processes and factors with the different physical factors that have varied in different regions of the same hierarchical order as also due to the human factors and processes themselves that have varied from region to region; hence the intricately varying regional landscapes and types.

Thus, the physical factors, which do offer some broad regions because of their relatively static and bold character, could not take us farther in our task—after all the natural areas they offer form the medium or the material and it is the culture of man-in-group which plays the agent to work out the region. For instance, if we select certain number of possible operating criteria for dividing the Great Plains of India, while working out the details, we may discover that certain factors do not operate as much in one particular region as in the other, while some other processes, not included in the selection of factors, become more significant, whereas the same may not be even traceable in its counterpart. This aspect provides the scope for subjective judgement and careful appraisal of the effectiveness of the criteria in each region. This may lead to constant adjustment, if not change in the region's delineation. Obviously, geographic regionalization is not water-tight.

In view of the above complexities, attempts have been made in the present regionalization scheme to incorporate the various distinguishing and meaningful regional factors and assess their role in the personality of each region in question. As such, we have worked out regions, analytically working from upwards down by taking into consideration the factors which have produced the existing regions as well as those which are causing the emergence of new regions from the existing ones. For instance, the *Son-par* country of the

Mirzapur district is emerging and carving its own region from out of the tangled tribal wilderness characteristic of the area in general. Forces of modernization being strong, this impact is fast, rather sudden, and against all the tenets of the physical factors or even the long sweep of human history. This point is important for the premises of the present regional scheme—it brings home to the mind that although natural zones based simply or collectively on structure, relief, soil, climate and other physical factors are taken with some justification as boundaries because they provide relatively stable boundaries, they “become less and less coincident with the real human regions”, as we delve down into details of regional analysis on the lower levels of regional hierarchy.

Another fact is also important. India being an anciently peopled country, the extent of interaction between man-in-society and environment has proceeded further here than in many countries, and has resulted in more intensive diversification in landscapes. What Fisher noted for the Middle East aptly fits in for India: “As in many parts...the Archaean basement rocks occasionally obtrude at the surface to form important elements in the modern landscape, so also we find a parallel in that contemporary social life is markedly coloured by past events with an unaltered persistence of some practices throughout many thousands of years”. Thus, sequent occupance patterns are also significant elements in the regional disparities and have to be given due consideration in regional assessment and delineations.

The Regional Scheme

Geology, structure, relief and physiography together with the positional factor provide a fairly clear-cut division of India into four units, viz. the Himalaya Mountain Region, the Great Plains, the Peninsular Uplands and the Indian Coasts and Islands. These are simple but effective macro divisions of the country and go well with the various patterns of the land in general. They are mutually distinct from each other, each having distinctive regional personality, and providing distinctive ‘living space’ with different set of factors. Each of these contrasts with the other in structure, landforms, climate, soils, natural

vegetation, population and settlement distribution patterns, cultural aspects, economic development and, above all in the range of possibilities and challenges.

What is pervasively more significant is that within each macro region there are one or more 'core' areas where the typically characteristic geographic-patterns of the region in general are developed *par excellence*. Around these Core areas, though the characteristics become more apparent than real, they never lose the regional distinction.

The Himalaya with its young geological formations, bold and massive and repeatedly contrasting relief features, lofty snow-clad peaks, narrow entrenched valleys, glens and dales, swift flowing streams, majestic forests, tiny and terraced agricultural farms, scattered settlements and population distribution, at best sinuous in nature along the valleys and the few roads, and numerous sequestered and isolated culture groups and extensive stands of non-humanized natural landscape; regional features throw as bold a contrast as its lofty peaks to the seemingly featureless, isotropic character of the Great Plains below with large sluggishly meandering rivers, fertile soils, induced vegetation, endless agricultural farms, densely settled population groups and settlements, dense network of transportation, and all humanized landscapes.

South of the Great Plains are the vast Peninsular Uplands, standing in contrast to the Himalaya or the Plains in all region-making factors from geology, structure, relief, physiography and other physical features to the wide range of economic and cultural patterns. Structurally the oldest landmass in the country and rimmed on the sides by the complex of mountains, highlands, plateaux, peninsulars, river-basins, troughs etc., rather sharply but boldly in the east by the Eastern Ghats, the Uplands contain within the interior features of senile topography as a whole, mazed by a series of flat-topped plateaux alternating with basins of highly mature rivers, graded almost to their hilt in the Sahyadri and cutting through the Eastern Ghats, and are dotted all along with the left-overs of erosion into the form of residual hills, ridges, mesas, buttes etc., particularly in the Vindhyan landscape. Culturally

also it shows more anciently settled people and more archaic culture pockets than in the Himalaya or the Great Plains. The highland and plateau complex between the Great Plains and the Deccan proper and extended to the Meghalaya is a tangle of cultural wilderness, harbouring as it does the Bhils in the Aravallis, the Gonds in Central India, the Mundas-Hos-Uraons and others in Chotanagpur and Orissa Highlands and many tribals in the outlier, the Meghalaya. These culture groups sustain themselves by slash and burn or other primitive subsistence agriculture, and their culture traits are topped by a thin veneer of Hinduism. Dandakaranya, the Nilgiris, Cardamoms and other pockets also sustain such primitive groups with pervasive cultural lag by centuries, if not tens of centuries. On the other hand, interior plateaux have extensive and advanced agricultural and irrigation systems, dense settlements, and modern transformations. Also the Uplands are the only mineralized (actual and potential) region of significance in India.

The boundary between the Great Plains and the Peninsular Uplands is drawn along the rims of the forelands cutting across the convenient points compromised between the tongue like alluvial embayments into the Uplands on the one hand and spurs alternated by these embayments and projecting from the Uplands toward the Plains on the other; Bundelkhand boundary hugs the river Yamuna very closely right on to the plains and so also the Meghalaya runs close to the Assam Valley.

The so-called structural affinity and 'shore facie' nature of the Indian coasts with the massive Peninsular Block and perhaps their 'marginal' location around the latter dissuades some scholars from according them macro-status in India's regional scheme, which they seem to deserve from all other points of view. By looking at the Coasts "in all their aspects interlocked", using Mackinder's phrase, they appear different enough from the Peninsular Uplands to enjoy a separate macro-level rank. Overlapping them and rather tying these fast moving coasts with the huge, slow-moving Peninsular Uplands amounts to sacrificing true accuracy, which depends so much on the unit and scale accorded to a region.

In fact, clinging to the 'standard' three-unit division of India by tying the coasts to the Peninsular Uplands smacks of a geographical violence and going stereotype. Its maritime location, general low relief with plain characteristics, high rainfall and general marine influences, mangrove and other swampy natural vegetation etc. provide it a different ecology from that prevailing in the Peninsular Uplands characterised by interior location, girdled by mountains, hills and plateaux, higher relief, lower rainfall, etc. Agricultural and industrial economy with dense population, port cities and towns, historically important maritime contracts all loom large to have permitted it to wear an individuality than being tied as a 'shore facie' to the huge Peninsular landmass. The core areas of the coasts are the deltas of the Mahanadi, the Godavari, the Krishna, the Kaveri, and the flat plains of Tamilnadu and Kerala, Gujarat and Saurashtra and even narrow but historico-culturally and ecologically different Kanara, Goa-Konkan coasts. The western boundaries are sharp, while on the east, even if the valleys broaden into the interior cutting through and thus accentuating the discontinuities of the Eastern Ghats, this fact makes the broader eastern plains develop their individuality instead of sharing the Upland characteristics by exploiting the resources of the interior and to tilt the rate of the regional economic growth to their favour. The economic and cultural backwardness of the interior Orissa Hills as compared to the Utkal Coasts, that of Telangana and Rayalaseema to the Andhra Coastal Plains and that of South Sahyadri to the Tamilnadu Plains are cases in point. The west coast provides rather a more glaring example of contrast.

As to the question of the boundary, we may note that no boundary can be thin, knife-edge sharp; we have to reckon with thick, transitional boundaries after all so they are actually on the ground, on the map, in human affairs, and in geographers mind too.

As land areas, the coasts may be marginal, but within the marine sphere of influence, incorporating the Bay of Bengal, the Arabian Sea and the Indian Ocean, taken as the living space of the

country with the strategically located Indian Islands, their dimensions have to be reckoned with in their consideration as macro region.

In dividing the macro-regions into meso-regions our central idea is to strike a "compromise between excessive attention to detail and too bold generalization" possible and practicable under the framework of our study. The number of criteria and factors naturally increase as we focus more on smaller units. We note that some of the units suggest themselves or are "automatically suggested" by the clarity of their boundaries, physically and culturally fixed, as in the Bundelkhand; others are given into regions with their cores and the land they hold on the margins as the Malwa Region or the Chhatisgarh Region; in other cases there are large expanses of transitional areas as in the Great Plains where not only the task of placing the boundaries is difficult, but any type of regional delineation is subject to question and criticism. However, close inspection and flexibility in terms of criteria can give correct orientation. Playing geographical factors in interaction with the historico-cultural organization of space has proved very helpful in the present study to mark out regions from out of a bewildering complexity of physical phenomena or even of political jumble. Bundelkhand, Malwa etc., are important cases in point.

In view of the objectives and premises of regionalization outlined above, the country has been divided into twenty-eight meso-level regions as noted in the accompanying table (Fig. 1.16).

Geologically youngest, economically the most significant and culturally constituting the main axis of India, the Great Plains deserve the first rank of treatment. In the seemingly featureless and isotropic Great Plains, sweeping east-west through the open valleys of the Ganga and the Indus systems, transition in level and lie of the land, climatic features, natural vegetation, types of crops, cropping patterns, house-types, dress of the people and their language and other cultural features, is the general rule; between the two ends of over 2500 km stretch, the arid Rajasthan Plain in the west and the per-humid Lower Ganga Plain in the east, lie the semi-arid Pun-

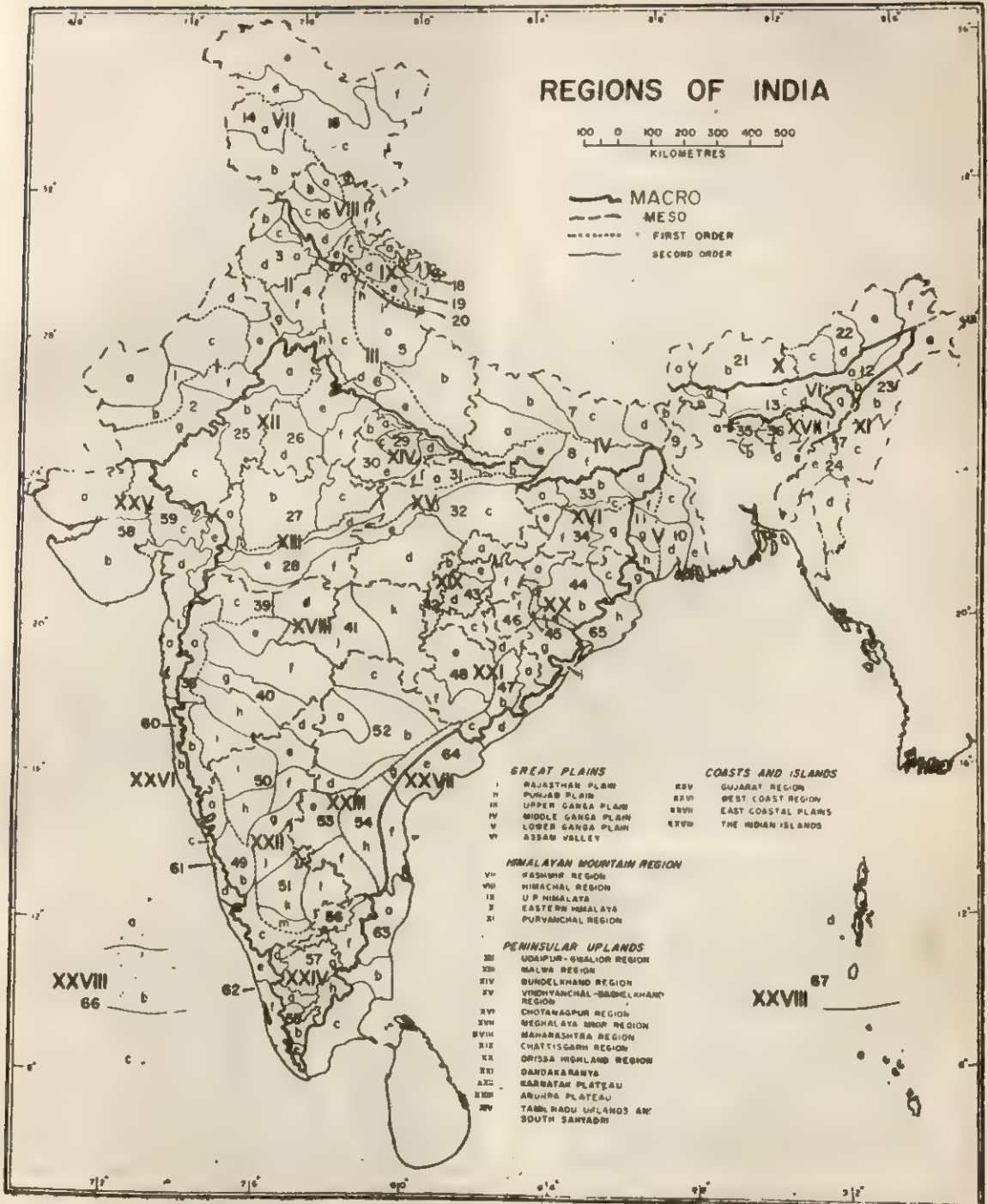


Fig. 1, 16

jab Plain, the sub-humid Upper Ganga Plain and the humid Middle Ganga Plain, and beyond the Lower Ganga Plain, the humid Assam Valley, each merging or melting into the other imperceptibly, rather unawares. Nowhere do they offer even thick boundaries—all is transition in a continuum. The rivers, particularly the master streams and their principal tributaries with their bluffs are the only topographic breaks but stand to no scale regionally speaking, while the soil groups such as the Khadar and the Bhangar also are at best phenomenon of minor local importance; the isohyets also, as Spate has stated, run diagonally north-west-south-east across the lie of the land and do not offer any ecological boundary by themselves. However, patterns of relationship, arising from the interlocking as they do of the climate and types of crops and cropping systems, seem to provide, as composite factors, significant key for dividing the plains into workable sub-units. The leading regional crops along with others of secondary and tertiary importance balanced with them, are the true index of regional ecology and offer workable boundaries. Millets in arid Rajasthan, wheat and gram in the semi-arid but irrigated Punjab, wheat-rice in sub-humid but irrigated Upper Ganga Plain, rice and wheat-barley in the Middle Ganga Plain, rice-jute in per humid Lower Ganga Plain and rice and tea in Assam Valley are the major regional crops with different crops of secondary or tertiary importance. Thus we get six meso-level regions in the Great Plains.

The boundary of the Rajasthan Plain accords completely with the State boundary in the north, West Pakistan in the west, Gujarat in the South and Aravallis in the east. The boundary between the Punjab Plain and the Upper Ganga Plain similarly follows the convenient State boundary of U.P., Haryana and Delhi.

The boundary between the Upper Ganga and the Middle Ganga Plains runs roughly north-south through 'the indeterminate passage zone of Oudh'—running from Allahabad through the districts in the north. Stamp has taken roughly 100 cm isohyet; Spate has adjusted his boundary "Conforming quite closely to an area of more

mixed main crops to the west in the Upper Ganga Plains and the Middle Ganga Plain in the east where rice predominates with an acreage at least double that of wheat". The actual boundary drawn in the present scheme is based on the adjustments of roughly 300' contour, crop combination, population density, historical patterns and, above all, the administrative units. Likewise, the actual boundary between the Middle and Lower Ganga Plains corresponds with the Bihar-West Bengal state boundary in general, except locally where the Kishanganj tahsil of Purnea (Bihar) has been included in the Mahananda corridor of the latter. Assam valley has positional significance, sandwiched as it is, as an obvious unit, between the Meghalaya-Mikir region and the Eastern Himalaya; the landscape is subject to the oscillations of the Brahmaputra and is ecologically and humanly all distinct from the two other units.

The Himalaya Mountain region, from the Himalayan Kashmir in the north-west to the Purvanchal in the east, with its maze of mountain ranges and basins of diverse sizes and scales on the one hand and their general sinuous character on the other, offers a difficult problem. The Himalaya comprise within its bounds some sub-regionally important 'cores' like the valley of Kashmir, the Kangra Valley, the Dehra Dun, Manipur Valley etc., and also some more localized and isolated vales and basins like the Lahul, the Spiti or the several *Duns*, but most of these stand to no scale for sub-regional division. Other 'Core-like' developed and transversely organised units such as the Jammu region, Himachal Himalaya, U.P. Himalaya (Kumaun-Garhwal Himalaya), Darjeeling-Sikkim Himalaya, Bhutan Himalaya and Assam Himalaya form comparatively larger units. Rainfall decreases in general from east to west, the latter being comparatively much drier (Leh : 8 cm) and vegetation zones run in sympathy with the rainfall, although also with the altitudinal zones and exposures. There is also distinctive demarcation in terms of flora and fauna when we consider the two Himalaya, the Eastern including the Darjeeling Himalaya eastward and the Western covering U.P. Himalaya westwards. "The human adjustments to (such)

a complex and difficult environment" nicely and minutely but delicately maintained over centuries has given rise to as intricate and high scale of fragmentation as the physiography itself; and as a result there are multitudinous social and culture worlds of bewildering variety, scale and diversity. The economy runs through pastoral valley and high-altitude transhumance, lumbering, and from terraced agriculture on some of the worlds' highest altitudes to fruit tree farms, market gardening, traditional handicrafts and to more modern tourist industry. The ethnic and social groups range from the Caucasoids through various mixed-bloods to the Mongoloids-Kashmiris through the Jats and Dogra, Rajputs and Gujars of the Jammu, Himachal and U.P. Himalaya to the Bhotias of the Sikkim and Darjeeling Himalaya, various tribals of the Assam Himalaya, the Nagas, Manipuris and the Mizos and the Indo-Burmese groups etc. of the Purvanchal. Politically also the Himalayan jumble is incomparable: it comprises Nepal, the sovereign state, Sikkim, an Indian Protectorate, Bhutan under special treaty with India, the NEFA, a Central Territory ruled through the Governor of Assam, Centrally Administered Territories of Himachal Pradesh, Manipur and Tripura, full states of Jammu and Kashmir and Nagaland, and parts of States of U.P., West Bengal and Assam.

Based on over-all regional ensembles, then, the Himalaya Mountain Region has been divided into Kashmir region, Himachal region, U.P. Himalaya, Eastern Himalaya and the Purvanchal. The Purvanchal has been so termed as it lies on the eastern border, historically enjoying relatively greater isolation, and also includes, apart from the eastern hills, the Kachhar Plains.

The Peninsular Uplands have been divided into 13 regions of meso-order, based on an amalgam of a wide range of factors—broad physical features such as the plateaux, river basins or troughs, combined with cultural factors such as the types of economy as that of primitive subsistence agriculture of the Vindhya-Chhota-Nagpur region or Orissa Hills or advanced mineral-industrial inducements overlain on the tribal economy as in Chotanagpur; extent of historical

isolation as of the Dandakaranya or regional sustenance through the fusion of waves of cultures and peoples as the Malwa or Bundelkhand, or broad language and culture groups, now forming states (although marginally adjusted with neighbouring regions and with their coastal counterparts) such as the Marathi-speaking Maharashtra Plateau (the Marathwada or the home of the Marathas), Telugu region—Andhra Plateau, Kannada region—Karnatak Plateau, and Tamilnadu Upland and south Sahyadri, the culture area of the Tamils. The actual boundaries accord to the general political units as far as is possible within the general frame of geographic personality; for example, Dandakaranya, lying mostly in M.P. includes parts of Andhra Ghats and Orissa Hills and valleys. Similarly, part of Kerala Ghats have been merged with the Karnatak Plateau, and so also the whole of the South Sahyadri, lying within Kerala, forms part of the Tamilnadu Uplands and South Sahyadri. A rather more intricate interdigitation of areas lying within the political boundaries of M.P. forming the major part, and of U.P. and Bihar, can be seen in the Vindhya-Chhota-Nagpur region; as a matter of fact, the region is in the making, the integrating force being exercised by the Rihand Project, Singrauli coal basin, developing road and railway networks with the provision of the road and railway bridge on the Son, leading to the development of a 'growth pole' around Pant Sagar, likely to serve the surrounding regions as well.

The Indian Coasts and Islands have obviously been divided into the Gujarat Region, the West Coast, the Eastern Coastal Plains and the Indian Islands. The distinction between the Gujarat region and the West Coast has been accentuated by the Gulf of Cambay and the Core-like situation of the Girnar hills with trappean capping. Gujarat region is further differentiated by the lower estuarine valleys of the Narmada, the Tapi and the Sabarmati. Culturally also it is the Gujarati region which runs with the state boundary excepting in the north-east where the Aravallis have encroached, and as such, this part merges with the Udaipur-Gwalior region.

MESO LEVEL REGIONS**FIRST ORDER****SECOND ORDER****A. Great Plains :****I. Rajasthan Plain**

1. Marusthali

- { a. Jaisalmer Marusthali
- { b. Barmer Marusthali
- { c. Bikaner-Churu Marusthali

2. Rajasthan Bagar

- { d. Ghaggar Plain
- { e. Shekhawati Region
- { f. Nagaur Region
- { g. Luni Basin

II. Punjab Plain

3. Punjab Plain North

- { a. Hoshiarpur—Chandigarh Plain (Sub-Mountain belt)
- { b. Upper Bari Doab
- { c. Jullundur Plain
- { d. Punjab Malwa

4. Punjab Plain South

- { c. Ambala Plain (Sub-Mountain belt)
- { f. Eastern Haryana (Kurukshetra Plain)
- { g. Western Haryana
- { h. Southern Haryana

III. Upper Ganga Plain

5. Upper Ganga Plain North

- { a. Rohilkhand Plain
- { b. Awadh Plain

6. Upper Ganga Plain South

- { c. Upper Ganga-Yamuna Doab
- { d. Trans-Yamuna Plain
- { e. Lower Ganga—Yamuna Doab

IV. Middle Ganga Plain

7. Middle Ganga Plain North

- { a. Ganga-Ghaghara Divide
- { b. Saryupar Plain
- { c. Mithila Plain
- { d. Kosi Plain

8. Middle Ganga Plain South

- { e. Son-Ganga Divide
- { f. Magadh-Anga Plain

V. Lower Ganga Plain

9. North Bengal Plain

- { a. Duars (Barind Tract)
- { b. Tista Flood plain

10. Delta Proper

- { c. Moribund Delta
- { d. Mature Delta
- { e. Active Delta

11. Barh Plain

- { f. Mayurakshi Plain
- { g. Bankura Upland
- { h. Midnapur Upland

VI. Assam Valley

12. Upper Assam Valley

- { a. Upper Assam Valley North
- { b. Upper Assam Valley South

13. Lower Assam Valley

- { c. Lower Assam Valley North
- { d. Lower Assam Valley South

B. Himalayan Mountain Region**VII. Kashmir Region**

14. Kashmir Region South

- { a. Kashmir Valley
- { b. Jammu-Mirpur Region

15. Kashmir Region North

- { c. Zaskar-Ladakh Region
- { d. Deosai-Skardu Region
- { e. Gilgit-Baltistan Region
- { f. Aksaichin Region

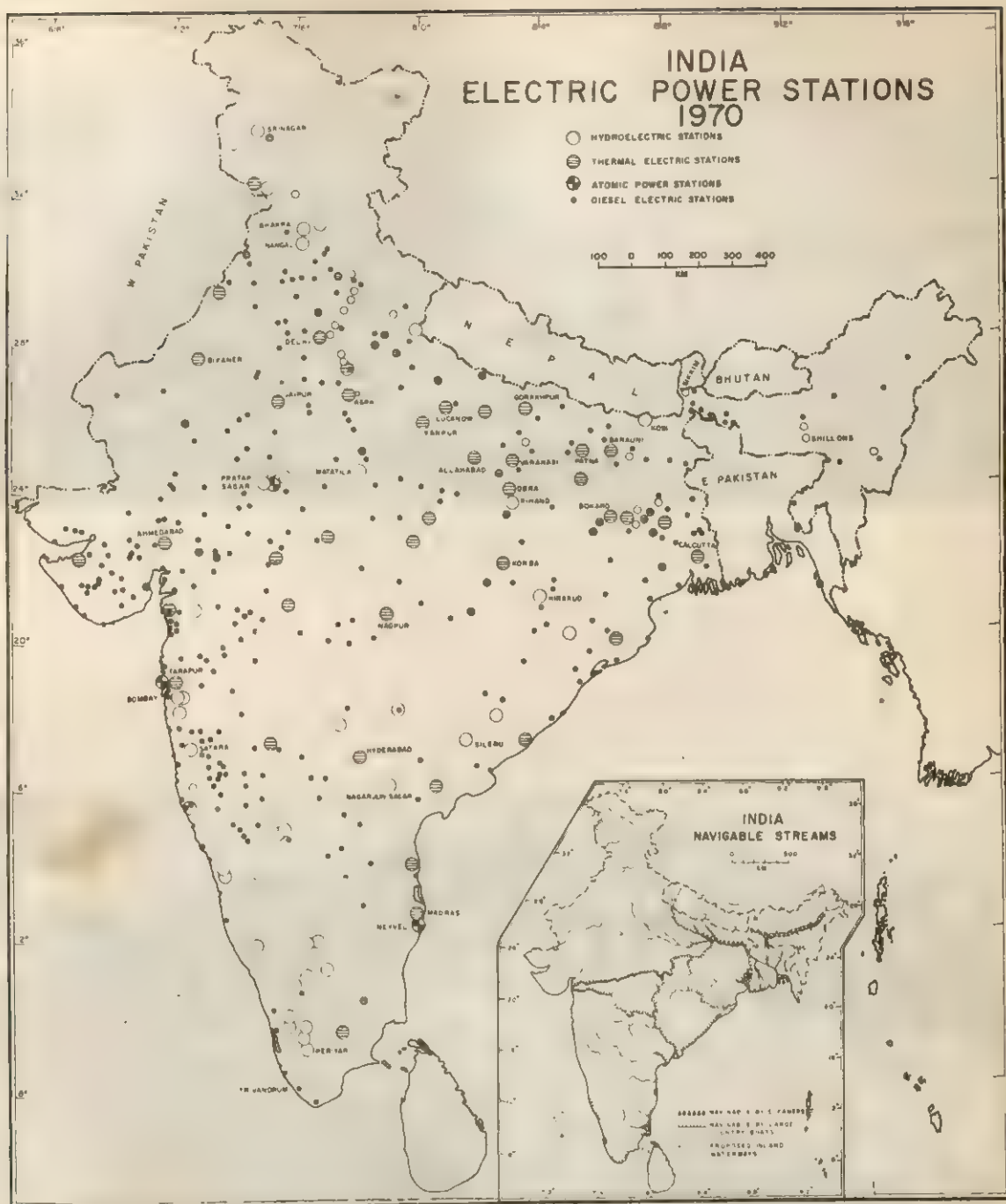


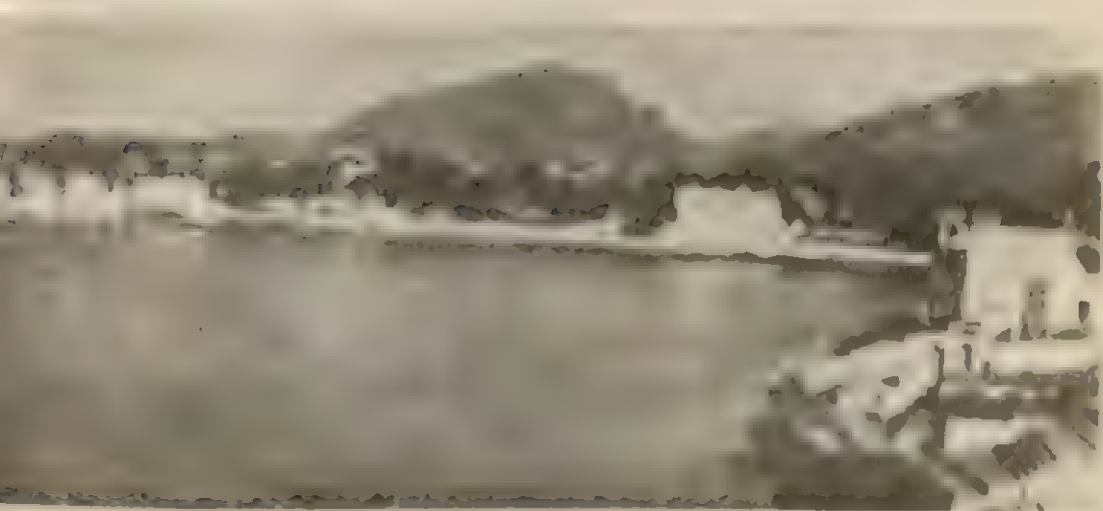
FIG 112



Pushkar Lake, Aymer

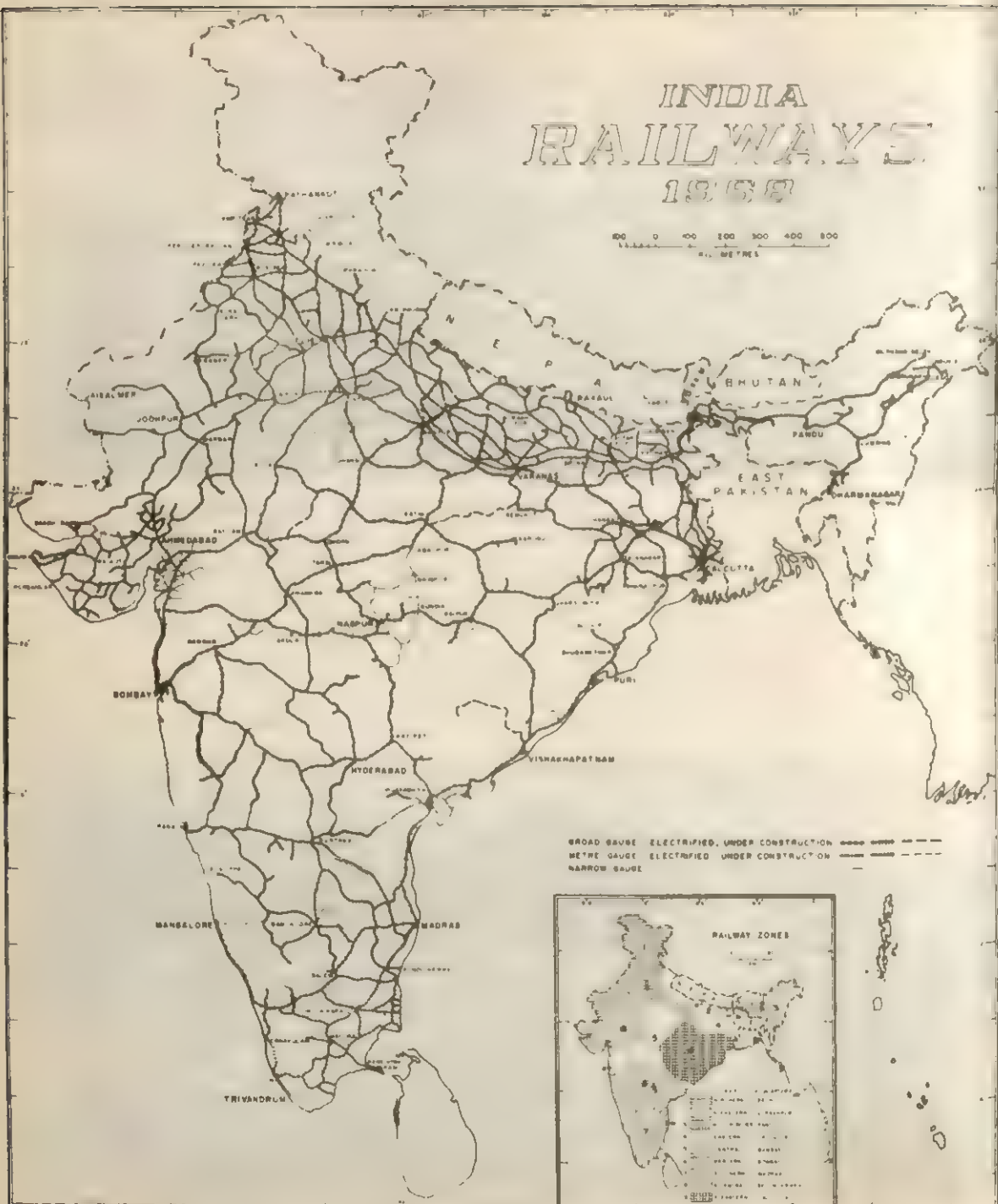


A Panoramic View of Vishakhapatnam



INDIA RAILWAYS 1958

0 100 200 300 400 500
KILOMETRES



MESO LEVEL REGIONS

FIRST ORDER

SECOND ORDER

VIII. Himachal Region	16. Himalayan Himachal	<ul style="list-style-type: none"> { a. Chandra Bhaga Basin { b. Ravi Basin { c. Beas Basin { d. Himalayan Sutlej Basin { e. Upper Yamuna Tributary Basin
	17. Trans Himalayan Himachal	<ul style="list-style-type: none"> { f. Spiti-Kalpa-Sutlej Basin { g. Malung Basin
IX. U.P. Himalaya	18. Himadri	<ul style="list-style-type: none"> { a. Himadri Ranges { b. Himadri Valleys
	19. Himanchal	<ul style="list-style-type: none"> { c. Trans-Yamuna Basin { d. Bhagirathi-Alaknanda Basin { e. Ramganga-Kosi Basin { f. Saryu-Kali Basin
	20. Siwaliks	<ul style="list-style-type: none"> { g. Yamuna-Ganga Tract { h. Ganga-Ramganga Tract { i. Ramganga-Kali Tract
X. Eastern Himalaya	21. Darjeeling-Sikkim-Bhutan-Himalaya	<ul style="list-style-type: none"> { a. Darjeeling-Sikkim Himalaya { b. Bhutan Himalaya
	22. Assam Himalaya	<ul style="list-style-type: none"> { c. Daffa Region { d. Miri Region { e. Abor Region { f. Mishmi Region
XI. Purvanchal Region.	23. Purvanchal North	<ul style="list-style-type: none"> { a. Lohit-Tirap Region { b. Nagaland
	24. Purvanchal South	<ul style="list-style-type: none"> { c. Manipur Region { d. Mizo Region { e. Tripura-Cachhar Region
C. <i>Peninsular Uplands</i>		
XII. Udaipur-Gwalior Region	25. Aravalli Uplands	<ul style="list-style-type: none"> { a. North Aravalli Region { b. Central Aravalli Region { c. Southern Aravalli Region
	26. Chambal-Sindh Plains	<ul style="list-style-type: none"> { d. Middle Chambal Basin { e. Lower Chambal Basin { f. Sindh Basin
XIII. Malwa Region	27. Malwa Region North	<ul style="list-style-type: none"> { a. Eastern Mahi Basin { b. Upper Chambal Basin { c. Upper Betwa Basin
	28. Malwa Region South	<ul style="list-style-type: none"> { d. Western Vindhyan { e. Middle Narmada Trough { f. Western Satpura
XIV. Bundelkhand Region	29. Bundelkhand Plain	<ul style="list-style-type: none"> { a. Ravine Belt { b. Jalaun Plains { c. Hamirpur Plains { d. Banda Plains
	30. Bundelkhand Uplands	<ul style="list-style-type: none"> { e. Bundelkhand Gneissic Region { f. Bundelkhand Vindhyan Plateau
XV. Vindhyanchal-Baghelkhand Region.	31. Vindhyanchal-Baghelkhand Region North	<ul style="list-style-type: none"> { a. Rewa-Panna Plateau { b. Mirzapur-Rohtasgarh plateau

MESO LEVEL REGIONS

FIRST ORDER

SECOND ORDER

	32. Vindhyanchal-Baghelkhand Region South	<ul style="list-style-type: none"> { c. Baghelkhand { d. Chhindwara-Maikal Plateau { c. Narmada-Son Trough
XVI. Chotanagpur Region	33. Chotanagpur Region-North	<ul style="list-style-type: none"> { a. Palamau Uplands { b. Hazaribagh Plateau { c. Damodar Valley { d. Santhal Pargana Uplands
	34. Chotanagpur Region-South	<ul style="list-style-type: none"> { e. Pat Lands { f. Ranchi Plateau { g. South-Eastern Chotanagpur or Singhbhum Region
XVII. Meghalaya-Mikir Region	35. Meghalaya-Mikir Region West	<ul style="list-style-type: none"> { a. Garo Region North { b. Garo Region South
	36. Meghalaya-Mikir Region Central	<ul style="list-style-type: none"> { c. Khasi Region North { d. Khasi Region South
	37. Meghalaya-Mikir Region East	<ul style="list-style-type: none"> { e. Jaintia Region { f. Mikir Region West { g. Mikir Region East
XVIII. Maharashtra Region	38. Maharashtra Sahyadr	<ul style="list-style-type: none"> { a. Maharashtra Sahyadri North { b. Maharashtra Sahyadri South
	39. Tapti-Purna Valley	<ul style="list-style-type: none"> { c. Tapti-Purna Valley West { d. Tapti-Purna Valley East
	40. Maharashtra Plateau	<ul style="list-style-type: none"> { e. Ajanta Hills { f. Godavari Valley { g. Balaghat Upland { h. Upper Bhima Valley { i. Mahadeo Upland
	41. Vidarbha Plains	<ul style="list-style-type: none"> { j. Wardha-Penganga Plain { k. Wainganga Plain
XIX. Chattisgarh Region	42. Rim Land	<ul style="list-style-type: none"> { a. Northern Rim Land { b. Western Rim Land { c. Southern Rim Land
	43. Chattisgarh Plains	<ul style="list-style-type: none"> { d. Raipur-Durg Plain { e. Bilaspur Plain { f. Raigarh Plain
XX. Orissa Highland Region	44. North-Eastern Hill Region	<ul style="list-style-type: none"> { a. North-Western Upland or Gangapur-Jharsuguda Basin { b. Garhjat Hills { c. North-Eastern Plateau
	45. Middle Mahanadi Valley	<ul style="list-style-type: none"> { d. Hirakud-Sonepur Valley Region { e. Baudh Valley Region
	46. South-Western Hill Region	<ul style="list-style-type: none"> { f. Hirakud-Bolangir Basin { g. Orissa Ghats Region
XXI. Dandakaranya	47. Dandakaranya Ghats	<ul style="list-style-type: none"> { a. Dandakaranya Ghats East { b. Dandakaranya Ghats Central { c. Dandakaranya Ghats West

MESO LEVEL REGIONS

FIRST ORDER

SECOND ORDER

	48. Dandakaranya Uplands	{ d. Tel-Jonk Valley Region e. Bastar Upland f. Indravati-Sabari Plain
XXII. Karnataka Plateau	49. Malnad (Central Sahyadri)	{ a. North Malnad b. Central Malnad c. South Malnad
	50. Maidan North	{ d. Bidar Plateau e. Gulbarga Plain f. Raichur Plain g. Bellary Plain h. Dharwar Plateau i. Bijapur Region
	51. Maidan South	{ j. Chitradurga Region k. Tumkur Region l. Bangalore Region m. Mysore Region
XXIII. Andhra Plateau	52. Telangana	{ a. Hyderabad Plateau b. Telangana Penecplain c. Godavari Valley d. Krishna Valley
	53. Rayalascema	{ e. Rayalascema Penecplain f. Rayalascema Plateau
	54. Andhra Ghats	{ g. Northern Andhra Ghats h. Southern Andhra Ghats
XXIV. Tamilnadu Uplands & South Sahyadri	55. South Sahyadri	{ a. Anaimalai-Palni Hills b. Cardamom Hills c. Agastyamalai Hills
	56. Tamilnadu Ghats	{ d. Nilgiris e. Mettur-Vellore Region f. Tamilnadu Hills
	57. Coimbatore-Madurai Uplands	{ g. Coimbatore Uplands h. Madurai Uplands
D. <i>The Indian Coasts and Islands</i>		
XXV. Gujarat Region	58. Gujarat Region West	{ a. Bhuj Region b. Kathiwar Region
	59. Gujarat Region East	{ c. Ahmedabad Region d. Khambhat Region (Cambay Region) e. Eastern Hilly Region
XXVI. West Coast Region	60. Konkan Coast	{ a. Konkan Coast North b. Konkan Coast South
	61. Karnataka Coast	{ c. North Kanara d. South Kanara
	62. Malabar Coast	{ e. Malabar Coast North f. Malabar Coast South

MESO LEVEL REGIONS	FIRST ORDER	SECOND ORDER
XXVII. East Coastal Plains	63. Tamilnadu Coastal Plain	a. Southern Plain or Vaigai-Tambraparni Region
		b. Delta Region
		c. Palar-Ponnaiyar Plain Region
	64. Andhra Coastal Plain	d. Pennar (Nellore) Region
		e. Krishna-Godavari Delta
		f. Vishakhapatnam Region
65. Utkal Coastal Plain	g. Chilka Region	
	h. Mahanadi Delta	
	i. Balasore Plain	
XXVIII. The Indian Islands	66. Arabian Sea Islands	a. Amindivi Islands
		b. Laccadive Islands
		c. Minicoy Island
	67. Bay Islands	d. Andaman Islands
		e. Nicobar Islands.
		Total : 192

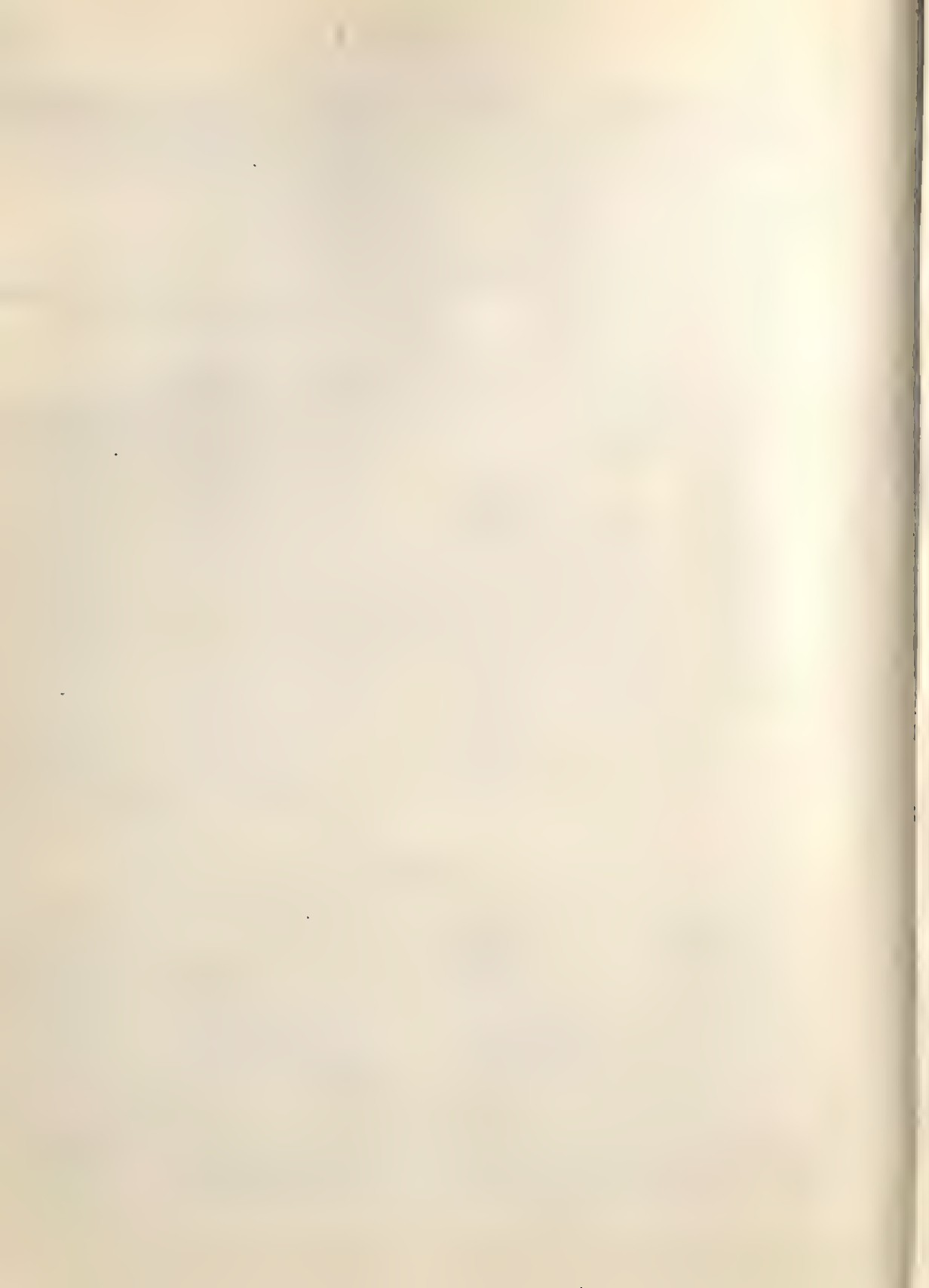
From the above Tabular Scheme it is quite obvious that the country is divisible in four Macro-level regions and twenty-eight (I-XXVIII) Meso-level regions. The Meso-level regions are divided into sixty-seven first order regions and one hundred ninety-two second order regions. The latter are further divisible into lower order regions which will be discussed in the analysis of the Meso-level regions concerned in the sequel. It may be remarked here that attempt has been made to achieve consistency in placing a particular feature, both physical and cultural, at the same hierarchical level if it continues in more than

one Meso-level regions; for instance, the Sahyadris enjoy the same status in Maharashtra, Karnataka and Tamilnadu Upland regions. Likewise, there is cultural pervasiveness between the Upper Ganga-Yamuna Doab and Eastern Haryana. As far as possible, local factors have been given due weightage in recognising the region at different levels. It may, however, be mentioned that the regions even at the same level vary widely in size and population as will be seen later (App. I). It is needless to emphasize that any attempt to achieve uniformity of this type and scale would have been quite impracticable.

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Great Plains of India

with an area over 700,000 Km² and population about 172 million is rather the largest absorber of population and politico-cultural shocks in the world, functioning, as it does, as the hinge belt in South Asia.

Amidst its great homogeneity, it also reflects the Indian unity in diversity. A superimposition of industrial landscape on its agrarian base would offer a great promise for economic emancipation of the people as also for national integration channels.



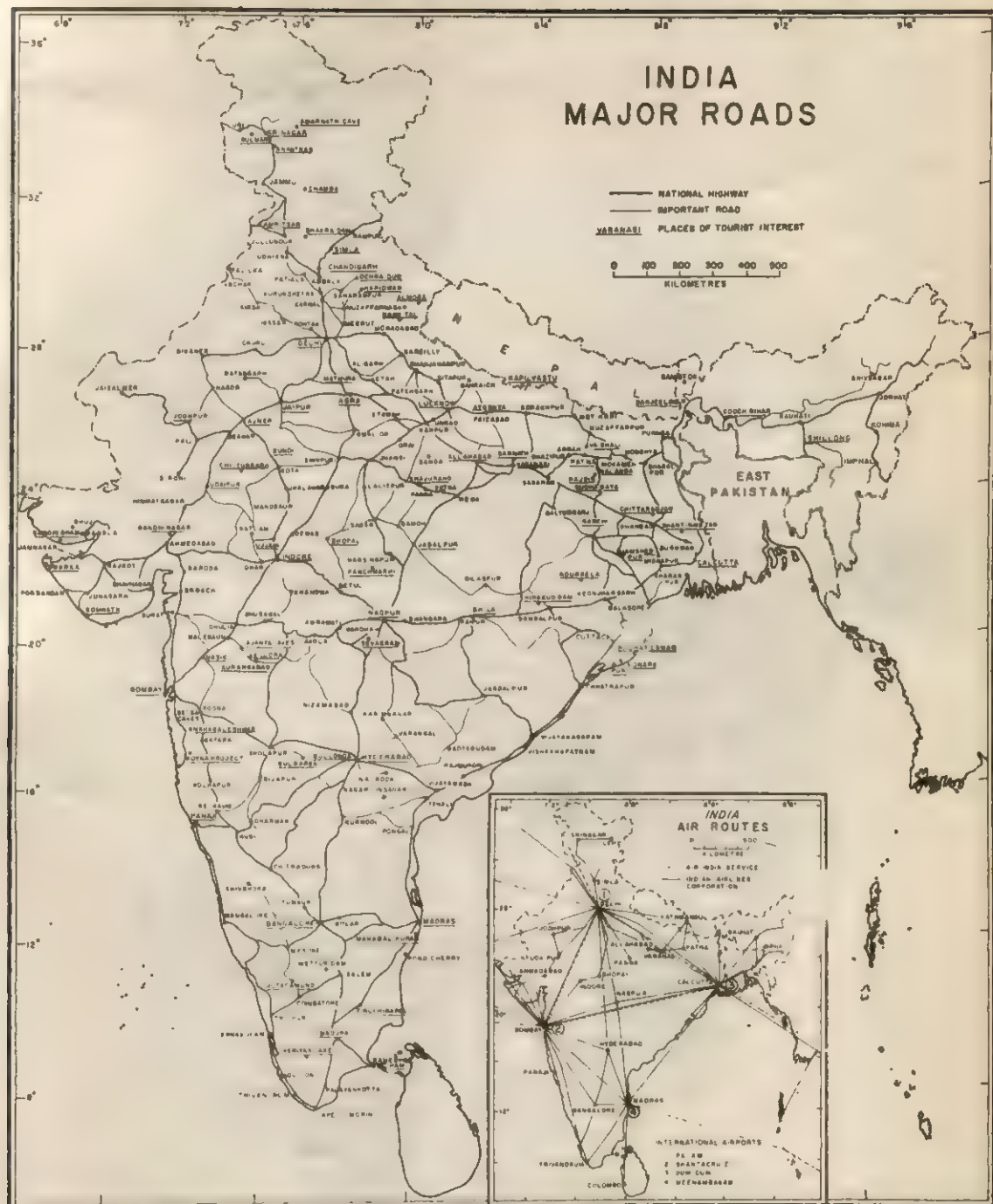


FIG. 114

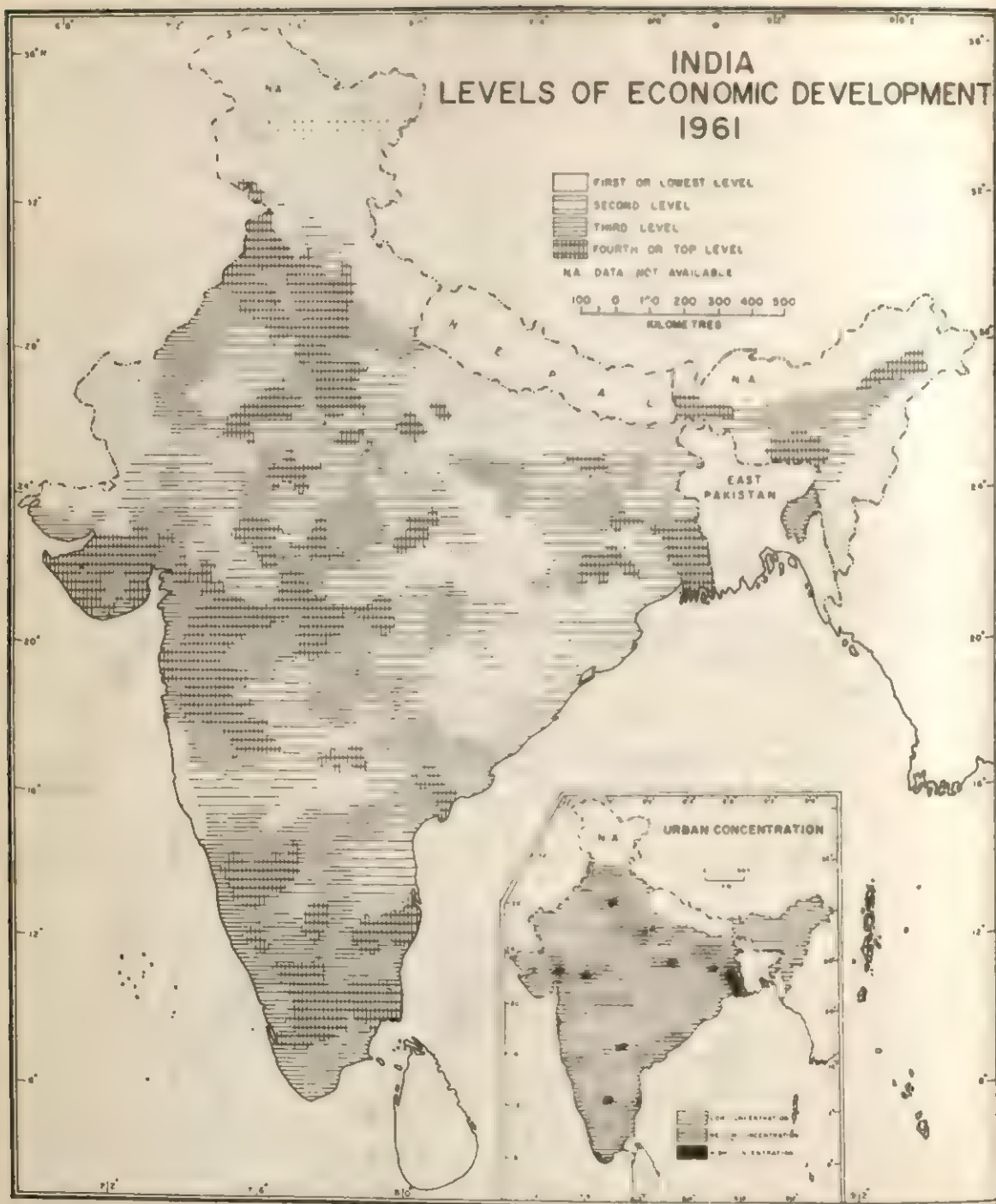


FIG 115

The Rajasthan Plain ($24^{\circ} 30' \text{ N}$ — $30^{\circ} 12' \text{ N}$ and $69^{\circ} 15' \text{ E}$ — $76^{\circ} 45' \text{ E}$) includes the Marus- thali (eastern portion of the Thar) and the adjoining Bagar (steppe land) to the west of the



Fig. 2.1

Aravallis extending over the western districts of Rajasthan, namely, Jaisalmer, Barmer, Jodhpur, Bikaner, Jalore, Nagaur, Ganganagar and Churu, along with the western portions of Pali, Sikar and Jhunjhunu districts (Fig. 2.1). It covers an area of 196,747 km² of Rajasthan. The whole of the "sanded over peneplain" of Marusthali and the Bagar receive less than 50 cm of annual rainfall.

Historical Background

Historical and archaeological evidences prove that the region, being well-wooded and suited for human habitation has been settled since remote historical period.¹ The Saraswati and Drishadavati rivers flowed through this part to the Arabian sea during the Vedic period. Dry beds of the Ghaggar, the Hakra, and the Eastern Nara are considered to be the old beds of these Vedic rivers.² Even the Indus had one branch flowing through this part into the Rann of Kutch. In the valleys of these ancient rivers, archaeological remains of the period extending from the Harappa to the comparatively recent, have been discovered.

Archaeological findings of Ghosh³ have thrown much light on the culture of the region. The excavations have confirmed the relative chronology of three cultures—Harappa, Greyware, and Rangmahal in the Saraswati Valley. He is of the view that "Harappa culture was essentially a riverine culture, which would have been impossible had the river been dead at that time. The Greyware culture which is traced to 1,000 B.C. had a somewhat shaky source of water due to the impoverishment of the land. During the Rangmahal culture, which followed 1,000 B.C., the people must have been more sure of adequate water supply and there was probably a partial resuscitation of the river system during the period. This again goes to prove that even in the recent times, in the last 3,000 years, there have been alternating periods of desiccation and adequate water supply in the region."⁴ "Inspite of desert conditions and the thin population now inhabiting the western areas, there is evidence to show that not only eastern parts, but even Jodhpur and Bikaner, the former on the border

of the Thar proper and the latter in the heart of the desert, were populated by foreign and Indian tribes from 5th century onwards, and Bikaner could support a flourishing riverine civilisation as early as 3,000-500 B. C. on the banks of ancient Saraswati of the Modern Hakra or the Ghaggar".⁵ These are historico-archaeological evidences to show that towns like Nagari, Sambhar, Bairh and Bairat were prospering as late as during 300 B.C. to 400 A.D.⁶ Todd also gave some historical evidences of much larger settlements during the 8th to the 12th Century A. D.⁷

The ancient history of the Western Rajasthan is obscure but has remained certainly very much linked up with other neighbouring regions. The region formed part of the Mauryan Empire while later there is evidence, traceable to the Junagadh rock inscription, that Rudradaman (C., A.D. 130-150) ruled over *Maru* or this desert country as one of the greatest of the western *Satrapas* (Saka governors). Later in the 4th century it fell under the sway of the Gupta.

In Huen Tsang's time (A.D. 640) the region was known as Gurjar (Gurjar or Kiu-che-lo of Huen Tsang) comprising Western Rajputana and the Indian Desert; it formed one of the three great states of Western India, the other two being the Sindh (from the Punjab to the sea) to its west and Balabhi (Ballabhi or Vallabhi more anciently but not contemporarily with the Saurashtra, comprising the peninsula of Gujarat with a small portion of the adjacent coast) to the south.⁸ It must have comprised the greater part of the present chiefships of Bikaner, Jaisalmer, and Jodhpur. According to various literary and epigraphic evidences, the Gurjar "still existed as a powerful kingdom, quite distinct from Saurashtra," nearly two centuries after Hwen Tshang's visit in A.D. 640".¹⁰ Although there is some point of dispute as to the *Kshatriya* origin or semblance thereof of the Gurjars in A.D. seventh century the king is said to have been a Tsati-li or *Kshatriya*.¹¹ Towards the end of the 9th century the whole of Rajasthan formed part of the vast dominions of the then paramount power of North India, the Gurjara-Pratihara dynasty of Kannauj, although various territorial Rajput

clans held the actual sway over the different territories. These clans kept themselves busy in internecine warfare, a factor which facilitated the onslaught of the Muslims. Later, the Rathors of Marwar (Jodhpur) became a powerful regional force, although the region mostly remained under the Mughals and was also run over by the Marathas later on. Later, the British functioned as the paramount power over the different states of the region. In the Independent India, the region forms part of the Rajasthan state which is constituted in four stages. Alwar, Bharatpur, Dholpur and Karauli, and the Chiefship of Neemrana formed the *Matsya Union* on March 18, 1948. Instantly in April, 1948, the first Rajasthan Union, comprising Banswara, Bundi, Dungarpur, Jhalawar, Kishangarh, Kota, Pratapgarh, Shahpur, Tonk and Udaipur came into being, and was termed the Greater Rajasthan Union by the inclusion of the remaining states of Jaipur, Jodhpur, Bikaner and Jaisalmer on March 30, 1949. On May 15, 1949 the Greater Rajasthan incorporated the *Matsya Union* and immediately part of Sirohi also. The only remaining state was that of Ajmer (formerly Ajmer-Merwara) functioning as a 'C' state of India and was included in Rajasthan as the Ajmer district in 1955 after the promulgation of the States Reorganization Act. There was some other territorial adjustment also. Abu Road Taluka of the former Bombay state and the Sunel Tappa of the former Madhya Bharat were merged with Rajasthan while Sironj sub-division of Kota district was transferred to Madhya Pradesh.

The territorial rulership, particularly by Rajput princely houses, over the greater part of Rajasthan, has been the key-note of its known history, and this factor has led to various appellations given to this region such as *Rajwara*, *Raethana*, *Rajputana* or *Rajpootana*, and ultimately the Rajasthan.

The Physical Setting

Geology

During the Permo-Carboniferous period the western Rajasthan was covered by sea. These areas contain marine sediments of the Jurassic

and later periods. The boulder beds of Talchir age (Permo-Carboniferous) at Bop and Pokaran may indicate that the Permo-Carboniferous seas covered western Jodhpur and Jaisalmer. The sea possibly extended also over parts of Bikaner.¹² There was regression of sea in early Cretaceous times followed by transgression during the middle Cretaceous, but ultimately there was recession during the Miocene and Pliocene periods. It is known that the Cambay-Ahmedabad-That was occupied by the sea up to geologically sub-Recent times. This sea would have extended through and to some distance north of the Rann of Kutch into the Indus, the Saraswati and the Luni valleys and some parts of Rajasthan.

Geological evidence suggests that monsoon conditions established in India in and after the Miocene, while the Pleistocene was a period of repeated glaciation. It is certain that only after the last glacial period desiccation set in the western Rajasthan after a long spell of alternating wet and dry conditions. "It is considered that occurrence of thick layers of powdery deposits of limestone, gypsum and salts are due to the influence of forest vegetation and prevalence of hot and humid climate. Concretionary form of deposit is due to the onset of drier climate and breakdown of biostasis indicating a humid climate alternating with drought and promoting erosion. In western Rajasthan, in the desert areas, such types of deposits occur widely indicating long dry periods alternating with humid climate".¹³ "The aeolian deposits belong to Pleistocene and Recent times. It is considered certain that the large amount of sand in this area, in different forms, originated from long continued aridity and sand drifting caused by the south-west monsoon. The wind blows with considerable force and the sand is derived from atmospheric weathering of rocky outcrops. The sand thus derived consists of quartz with grains of feldspar and hornblende. The sand particles are uniformly rounded by attrition."¹⁴ Such sands had also their origin in high mountain ranges and were later transported and deposited by rivers in the past times.¹⁵ In the dune-free areas of Barmer, Jaisalmer and Bikaner, marine deposits

of Jurassic and Eocene periods are exposed which show an anomaly in the nature of rock deposits in the region.¹⁶ Around Jodhpur there is exposure

by torrential rain on the old alluvium and piedmont deposit skirting these hills and later wind-worked to give rise to high hummocks and micro-

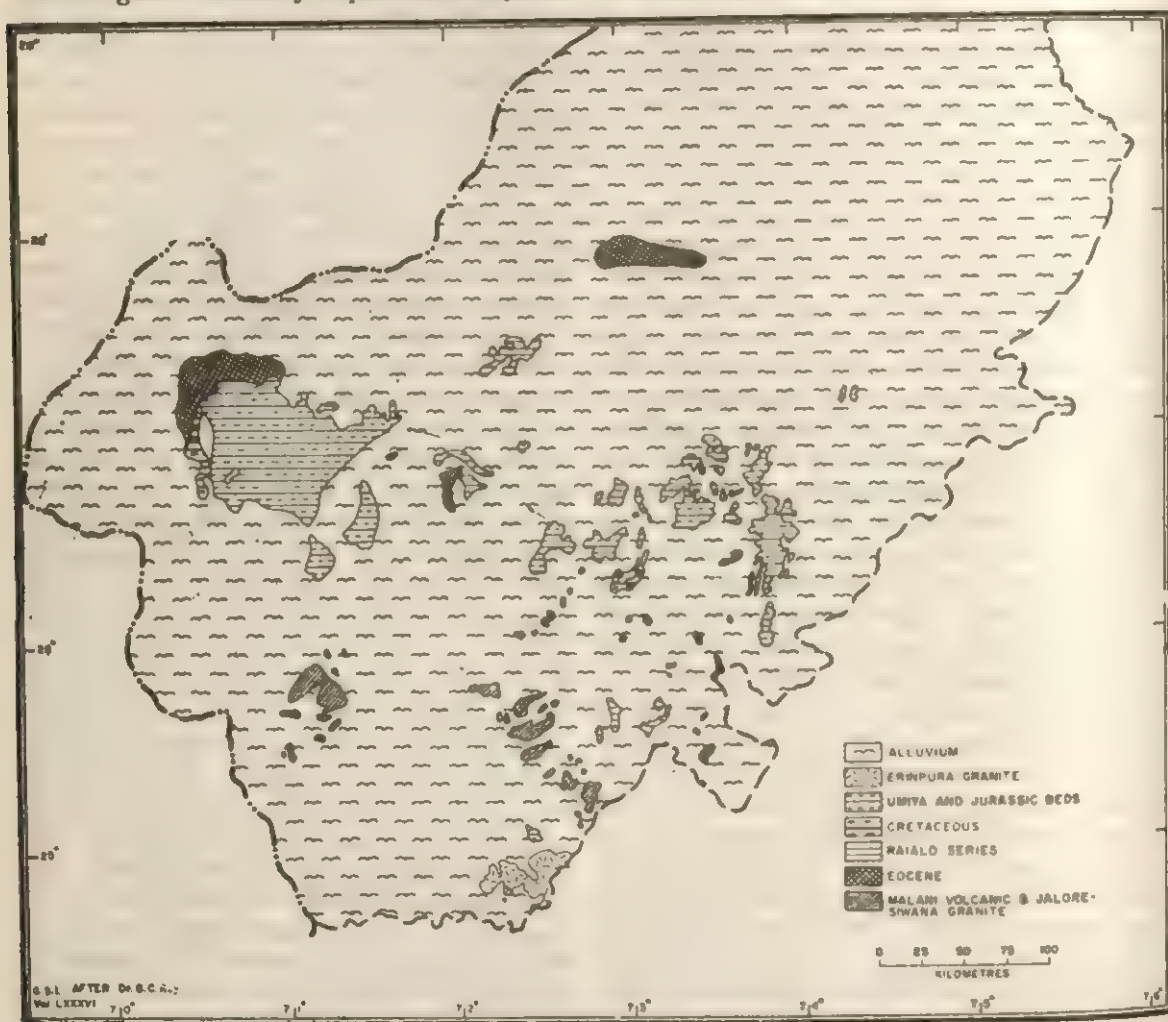


Fig. 2.2 Showing Geological Formations.

of rocks of Vindhyan System, while further south there are small patches of Malani volcanics and Jalore Siwana granite rocks (Fig. 2.2).

There are visible traces of periodicity of land surface formation in the recent past due to alternating works by winds and the occasional or periodic torrential storm rains. Aggraded fluvial deposits have been found covering the wind-sorted fine sands and vice versa. "Wind-deposited sands have been dissected and re-deposited

dunes. At places these have been again covered by aggraded fluvial wash from the hills", as on the flanks of the Jalore Hills as late as in the year 1964.¹⁷

Relief and Drainage

The region slopes, generally, from east to west and north to south. The north-eastern part of the region has a general elevation of about 300 m, but towards the south the elevation is

about 150 m excepting the Jalore-Siwana Upland which lies above 300 m. There are many small scattered hillocks marking the western edge of the Bagar. The western half is covered with sand dunes and small hillocks exposed in between. The most important river flowing in the region is the Luni which rises in the Aravallis south-west of Ajmer and flows towards the south-west. It

has several affluents coming from the Aravallis, the most important ones being the Sukri and the Jawai. The Luni reaches the Rann of Kutch only during the rainy season. It is apparent that, excepting the south-eastern portion, the rest of the Rajasthan plain is an area of inland drainage (Fig. 2.3). Thus, the following physiographic zones may be recognised from west to east.

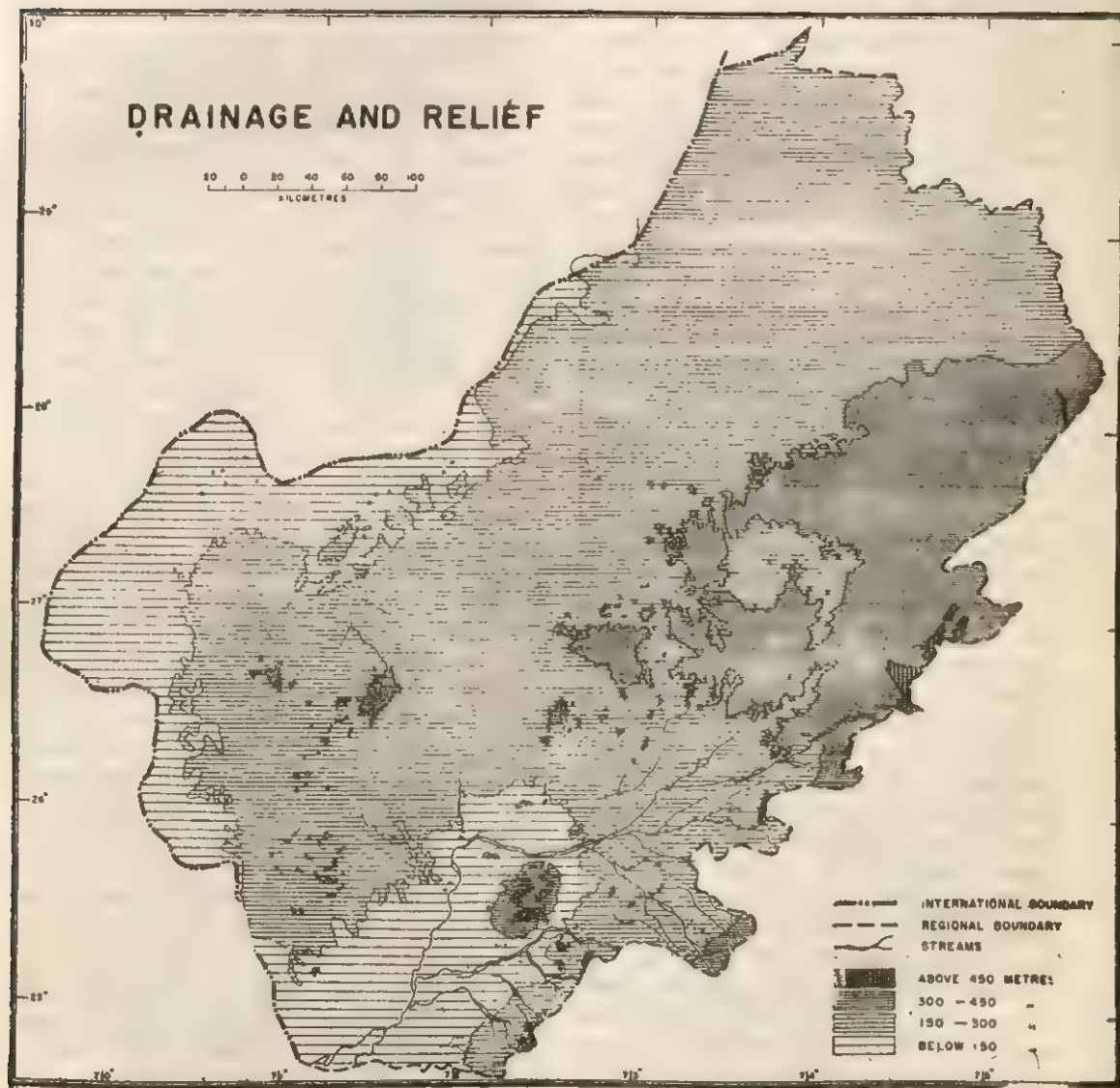


Fig. 2.3

(1) The westernmost belt is covered with sand dunes extending from the great Rann along the Pakistan border to Punjab. "There is multiplicity of types of dunes and of dune agglomeration in different parts of the Marusthali. On the basis of their shape, size, wind direction and vegetal cover, different types of dunes have been recognised in this region, namely, (i) Longitudinal dunes (*Seif* of Sahara or *erg* of Arabia); (ii) Crescent-shaped dunes (*Barchans*) of Turkestan; and (iii) Transverse dunes."¹⁹ The longitudinal dunes run south-west to northeast, parallel to the prevailing winds and are mostly sword-shaped. These dunes occur in the western and southern part of the region. Crescent shaped dunes have a gently sloping convex windward side and steep leeward side, varying in width from 100 to 200 m and in height from 10 to 20 m. These dunes are mobile. These are found in isolation or in longitudinal downward continuation or occasionally side by side in lines. The transverse dunes are formed athwart the wind and are commonly found in the eastern and northern parts of the Marusthali. The windward side is long and gently sloping, while the leeward side is steep and abrupt. Such dunes are stabilised in semi-arid part; trees are found on the leeward side.

(2) Next comes the rocky, comparatively dune-free tract of Jaisalmer-Barmer-Bikaner. The limestone and sandstone rocks exposed here belong to Jurassic and Eocene formations. Jaisalmer town stands on a rocky plain carved out of Jurassic sandstones. To the north of Jaisalmer a number of *Playa* lakes occur in basins bordered by low scarps. These lakes, though fed by centripetal drainage, remain dry for the greater part of the year.¹⁹ Short, intermittent and discontinued streams traverse the Jaisalmer Plain. The dry beds and banks could easily be tapped for ground water. Grit, conglomerate, gneiss, schist and granite rocks are also exposed at places.

(3) Eastward lies 'the little desert' having almost the same features as the westernmost region

covered with dunes and merging with the latter, north of Bikaner.

(4) In the easternmost part lies the semi-arid *Bagar* land drained by the Luni in its south-eastern portion. In this part the older rocks protrude above the surrounding sandy surface. Gullying has given rise to conglomerate landscape. The land is slightly undulating with thin veneer of sand deposited by the south-western winds. Towards the north lies the Shekhawati tract which is semi-arid transitional plain characterised by inland drainage and strewn with salt lakes such as Didwana, Kuchman, Degna and the great Sambhar, etc. In the extreme north lies the Ghaggar Plain.

It is clear from the foregoing that the relief features in Rajasthan plain are the product of both fluvial and aeolian erosion processes; the aeolian processes are more dominant in the western or Marusthali portion where the land is covered with various types of dunes. Even in the semi-arid portion rocks exposed above the surface in hills bear enough evidence of wind erosion. The wind-ward sides of the hills are full of small hollows caused by wind-blown sand attrition whereas the leeward sides have no such traces. There is mass of boulders capping the hills and accumulated on the hill sides because of lack of heavy rain, the boulders and the rocks, thus being subjected only to weathering.

Climate

The climate of Rajasthan Plain is characterized by extremely high range of temperatures and aridity although sharing the characteristic monsoonal variations through the year. It is the hottest region of India (mean June temperature 34.5° C at Jaisalmer and Bikaner) with annual range of temperature between 14° to 17°C. The temperature sometimes falls below the freezing point (−2.8°C at Ganganagar on 11 Feb., 1950 and at Bikaner on 4 Dec., 1950) and frosts commonly occur during winter while in summer the temperature rises above 40°C—the maximum occasionally reaching 50°C at places in the Marusthali as at Ganganagar on 11 June, 1934. The diurnal range of temperature is almost as much as

the annual range. The temperature begins to rise sharply everywhere from March, reaches the maximum in May and June and remains quite high until October, falling rather sharply thereafter to 15.5°C, but the range between the mean minimum and the mean maximum always remains high, the highest being obtained in May or June (Fig. 2.4). The mean maximum temperature in May and June is about 45°C over large part of the

region with mean minimum of about 23°C. The spatial variation is equally appreciable, with the temperature increasing westwards in summer as is experienced at Jodhpur (34°C), and Jaisalmer (34.5°C), and southwards in winter. December or January is the coldest month, the mean monthly temperature being 12.9°C; Bikaner 15.4° (Dec.), Jaisalmer (15.4°), Jodhpur (17.0°) and Barmer (17.6°C).

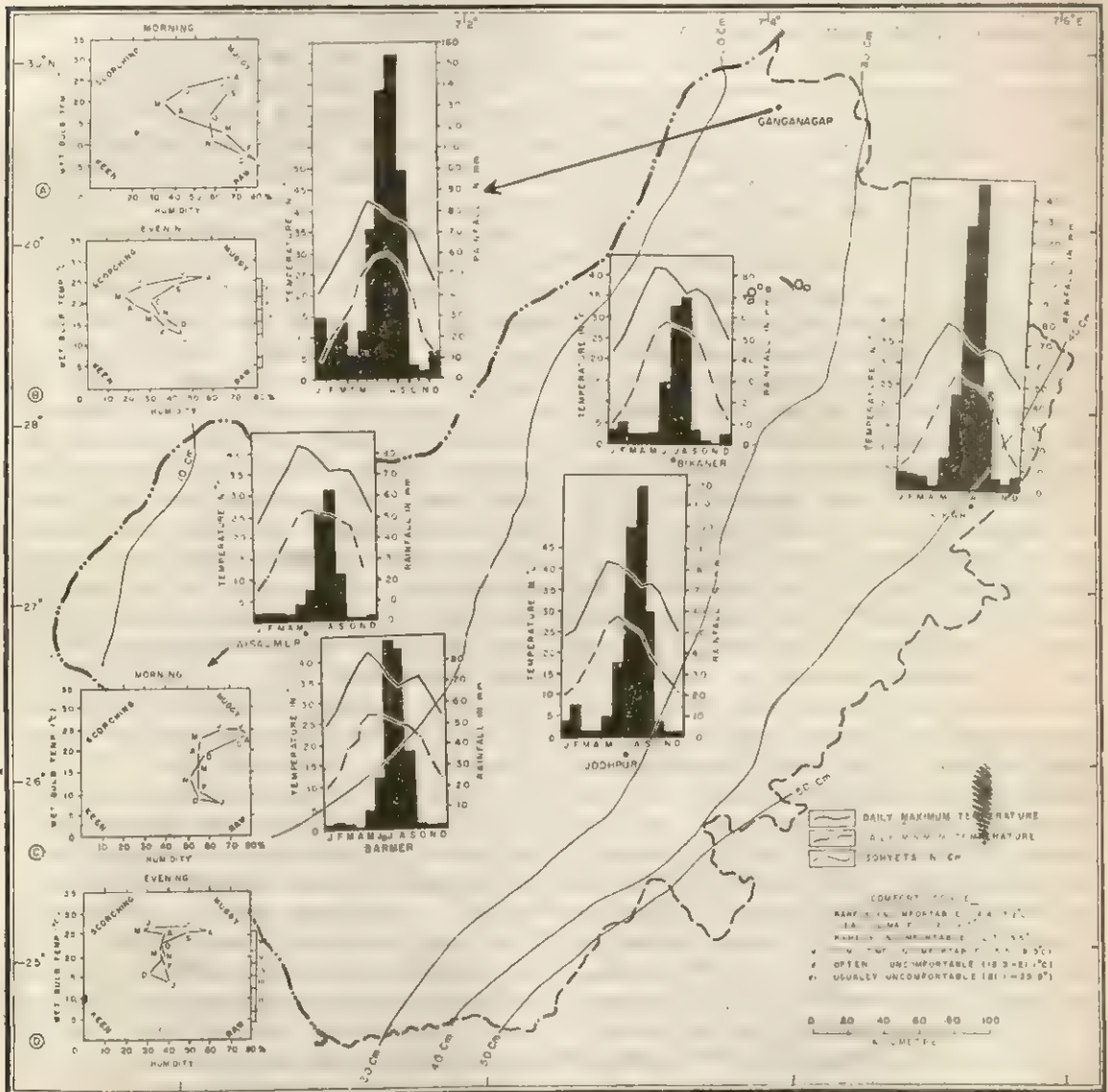


Fig. 2.4: Showing rainfall, temperature and climographs.

The highest mean relative humidity is found in wet months of the year from July to September when it varies between 55 to 70%; between March and May, however, it is the lowest, varying from 30 to 40% in general. In correspondence with the relative humidity, the mean cloud formation is the highest in July and August, varying from 2 to 6 (zero indicating a cloud-free sky and 10 an overcast sky). October is a cloud-free month. Dust storms are common which suddenly bring down the temperature causing occasional showers. These storms decrease in number and intensity eastwards. Ganganagar has, on an average, 27 days of dust-storms during a year while Bikaner has 18 days and Jodhpur only 8 days. The maximum number of dust storms occur in the month of June in the north-west and in May in the south and south-east. Thunder-storms, on the other hand, show a reverse trend of spatial distribution. Jodhpur experiences 25 days of thunderstorms in a year while Bikaner and Barmer each record only 10 days. The wind blows from west and south-west during the hot and rainy season with high velocity. The rainfall is generally scanty and uncertain.

The rainfall is very low, highly erratic and variable seasonally as well as yearly, throughout the region, particularly in the Marusthali. The mean annual rainfall, highly erratic in its incidence, varies from 10 cm on Indo-Pak borders and 21 cm at Jaisalmer to about 35 cm to 40 cm on the eastern edge of the region : the rainfall decreases from east to west (Jodhpur 38 cm, and Jaisalmer 21.7 in a comparatively wet year) and from south-west to north-east (Barmer 31.0 cm, Bikaner 30.4 cm and Ganganagar 29.6 cm), and variability increases in the same directions. Most of the rain occurs in the rainy months of July and August in short and stormy showers with a relatively high intensity : Bikaner receives over 62% of its total annual rain in July and August (19.1 cm out of 30.4 cm); Ganganagar about 50% (14.5 cm out of 29.6 cm), Jaisalmer over 80% (17.5 out of 21.7 cm), Jodhpur over 63% (26.7 of 38.0 cm) and Barmer over 70% (22.6 of 31.0 cm); the month of September generally receives lower rainfall than that of July or August,

The three monsoonal months, i.e., July—September, however, provide 75% to 90% of the annual total rainfall. The variability of rainfall is high and as high as 50 to 70% variability in the annual rainfall is not an unusual feature in the Marusthali. In fact, there are years in the heart of Marusthali when no rainfall occurs; Jaisalmer, for example, recorded no rain during last eight years prior to 1970, which year has recorded the highest rainfall of the century in the area. The highest ever recorded annual rainfall has gone up to 64.0 cm. (Ganganagar, 1945), 77.1 cm (Bikaner, 1917), 65.2 cm (Phalodi, 1917), 117.6 cm (Jodhpur, 1917), 89.5 cm (Barmer, 1944), and 45.3 cm (Jaisalmer, 1955).

Ground Water

The surface flow is ephemeral and limited to a few hours of days in general and a few months in such basins as that of the Luni and its tributaries, and the water-table shows significant bearing of these limited features. In the Luni basin, nearer the Aravallis the water-table is within 50 m of the surface and is suitable for "drinking and irrigation of winter crops from wells. Away from the Aravallis, in a broad belt across the desert along Jaisalmer-Bikaner axis the water-table sinks rapidly".⁹⁰ Wells are mostly more than 100 m deep, and the water supply is uncertain and gets more brackish and consequently unsuitable. The oases alone, which are highly scattered, support vegetation and human clusters with their artificial tanks or natural hollows or pools which collect water during the rainy season and retain the same for a few months or more. The water-table is higher (upto 30 m) in the Ghaggar basin along its old beds and in the vicinity of the Sutlej and steadily sinks down towards the west to go as low as 60 m deep and "soon falls below the economic limit of exploitation".

There is high water need in the Rajasthan Plain, being more than 140 cm annual in most of the Marusthali (Table 1). At Bikaner it is 154 cm, and over 160 at Jaisalmer, and there is no month without water deficiency. In the winter season when temperature is low, it also falls low being only 1.31-cm at Bikaner. As the temperature rises in summer, the need steadily in-

TABLE 1²¹

Station	Annual rainfall.	Monsoon rainfall.	(in cm.)		Annual water need	Summer need (3 months)	Max. monthly need	Minimum monthly need
			Winter rainfall.	Max. monthly rainfall with month.				
Barmer	29.99	21.63	1.16	13.38(Aug.)	156.23	60.82	20.76	2.18
Bikaner	29.07	17.62	1.36	9.14(Aug.)	153.88	63.48	21.32	1.31
Bhuj	34.59	23.52	0.63	16.08(July)	156.15	57.34	19.69	3.39
Hissar	42.57	23.24	2.64	12.37(Aug.)	143.62	62.43	21.06	1.16

creases and varies from 20 to 22cm in May or June over the Punjab plains, West Rajasthan (Bikaner 21.32 cm) and Sind; for the three summer months, in general, the water need varies from 36% to 54% of the annual total. It also remains high after the summer season, being 19.3 cm and 17.2 at Bikaner in August and September respectively. Later, it falls down as at Barmer from 15.1 cm in October to 8.3 cm in November, and at Hissar (Haryana) from 12.7 cm to 4.2 cm²².

Vegetation

The whole of this region is largely sandy and at places bare rocks are exposed. Vegetal cover is very thin and only a few small trees can be observed here and there. Large areas are covered with scrubs which are thorny and have a stunted growth. In the arid region *babul*, *Accacia senegal*, *Prosopis spicigera* and *Prosopis Juliflora* thrive. *Babul* is one of the best fodder trees of this region and it grows even under arid climatic and sandy topographic conditions. Among the native species *Prosopis spicigera* grows right from the semi-arid region in the east to the driest part of the desert as far as beyond Jaisalmer in the west. It also grows on rocky and sandy surfaces. In the arid region *Prosopis Juliflora* grows very well. It has remarkable power of drought-resistance and grows easily on exposed rocks. There are a few highly saline edaphic formations in depressions and 'Ranns' of the arid region where in places like Pachpadra, Sanwarla, Kanod, and Biramsar, halophytic plants are common.²³

It is contended that the desert of Rajasthan is extending north and eastwards into the fertile agricultural areas. "It is believed to have been

covered with a grass type of vegetation interspersed with trees of *accacia*, *Prosopis* and other genera which have been reduced to a desertic condition by centuries of overgrazing, burning and the cutting of trees and bushes for fuel or to provide emergency feed for livestock."²⁴

Soils

The soils of Rajasthan Plain are generally characterized as sandy, containing 90 to 95 per cent sand and 5 to 7 per cent clay. "This wind-blown sand, which has hindered soil formation, is derived partly from the surface rocks and a large part of it is blown in from the coastal regions".²⁵ The following types of soils are found in Rajasthan Plain (Fig. 2.5).

(i) *Desert soil* extends considerably over the districts of Ganganagar, Bikaner, Churu, Barmer, Jaisalmer, Jodhpur and Jhunjhunu. This soil contains a high percentage of soluble salt and has high pH value.

(ii) *Red desertic soil* extends over Nagaur, Jodhpur, Pali, Jalore, parts of Churu and Jhunjhunu districts. It has pale-brown to dark-brown colour and is good for cultivation, provided water is available.

(iii) *Yellowish brown sandy soils* are found in Nagaur and Pali districts. They are yellowish brown, sandy to sandy-loam and sandy clay loam. Lime concretion layer is present at 100-150 cm depth. It is a steppe soil and is suitable for cultivation.

(iv) *Alluvial soil* is mainly concentrated in the southern part of the Ganganagar district and parts of the Luni basin. Generally it has red colour but is deficient in lime, phosphoric acid and humus. This soil is good for agriculture.

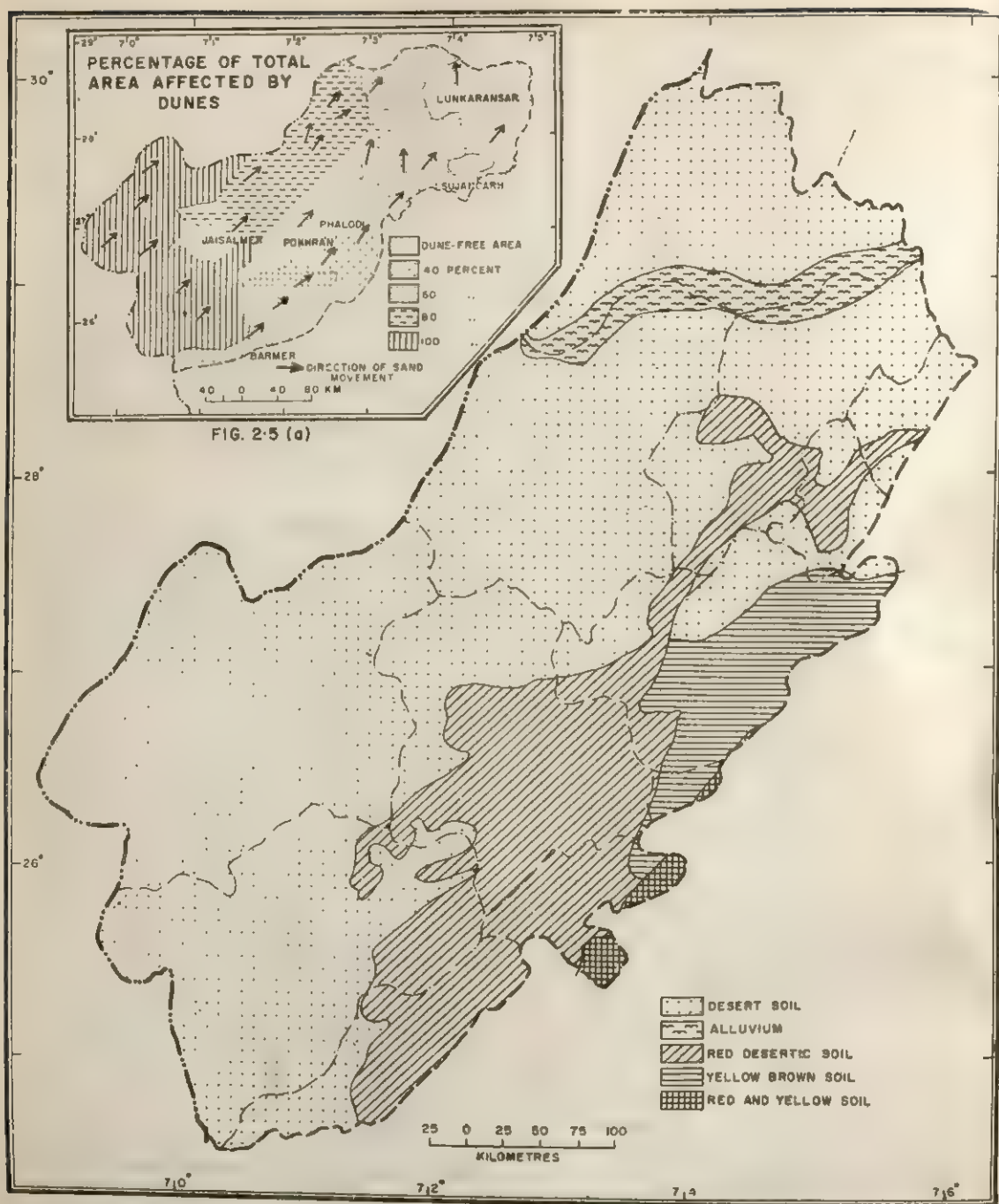


Fig. 2.5 : Showing Soils

In this plain region, saline soils are also found in the depressions or the 'Ranns' of Barmer, Jaisalmer, Bikaner and Nagaur. Agriculture in this soil is not possible due to high degree of salinity and impeded drainage. The only vegetation growing in this soil is a salt-resistant grass.

Minerals

Although Rajasthan is endowed with a great variety of minerals, the Rajasthan Plain is devoid of ferrous and other metallic minerals. A few important minerals, namely, gypsum, lignite, and fuller's earth, however, are concentrated in Rajasthan Plain.

Gypsum is the most important mineral of the region having an estimated reserve of about 424 million tons and accounting for 90% of the total production of the country. Of the total reserves (423.8 million tons) Nagaur has the highest (305.0 mill. T.), followed by Bikaner (79.0), Jodhpur (38.5) and Jaisalmer (1.3).²⁶

The reserves in Nagaur are found at a depth of 60-160 m while in Bikaner and Jodhpur they occur under shallow cover. The chief occurrences are at Jamsar, Lumkaransar, Jaisalmer, Dholera, Dhirera, Suratgarh and Bithnoke. Jamsar has the single largest deposit extending for about 4 km east-west and 920-1,225 m north-south along the railway line connecting Bikaner to Bhatinda. Gypsum occurs in horizontal beds of 20 cm-160 cm thickness under a shallow mantle of soil or sand. The maximum thickness of 6 m obtains in the two quarries south-west of Jamsar railway station. From here gypsum is sent to Sindri fertilizer factory in Bihar. Lumkaransar is another gypsum-producing area in Bikaner located along the same railway line about 52 km north of Jamsar. The beds are almost 1 m thick and spread over 5.2 km². In Nagaur the occurrences are found at Nagaur, Pohadwasi, Manglod, Khairat, Dhakoria, Bhadana and Vodhiasi. In Jodhpur the deposits occur at Phalsund in beds having 1 m thickness. In Jaisalmer it is found at Mohangarh, Hanurwali, Dhani and there are some deposits scattered in Jalore, Churu and Ganganagar districts also. Rajasthan is an important source of gypsum for the Indian cement-industry also.

Lignite occurs in Tertiary sediments in Bikaner district. The most important deposit is at Palana where two separate and adjoining areas have been proved to contain almost 20 million tons. Another occurrence is at Deshnokh with probable reserves of 15 million tons. Khari, Channeri, Gangasarowar and Mundh are the other mining centres in this area. Palana deposits, the most important lignite area in Rajasthan are located along the Bikaner-Jodhpur Railway, extending about 4 km in length and 1 km in width. The depth varies from 40 to 70 m, and the thickness of the seams varies from 50 cm to 80 cm. It contains about 36 % moisture, 42% fixed carbon, 8% ash and 3.4% sulphur. Presently this lignite is used for generation of electricity in Bikaner and Ganganagar. Testings indicate that it can also yield tar, oil, benzene and semi-coke after being treated in low temperature carbonizer. It holds good promise, therefore, for development of industries based on these by-products in this region which will be of great significance because of dearth of coal in Rajasthan. The annual output of lignite has been highly fluctuating. From 45,133 tons in 1952 it decreased progressively to 12,540 tons in 1958 but increased abruptly from 24,220 tons in 1960 to 58,640 tons in 1963. The mining is done by underground shaft method but since the overburden to lignite ratio is about 9 : 1 or less it is proposed by the Government to mine it by open cast method and increase the annual production to 500,000 tons by 1970-71.

Fuller's Earth is another mineral of national importance occurring in the Rajasthan Plain. The reserves are estimated to be 200 million tons in Barmer, Bikaner and Jaisalmer. It occurs as overburden in Palana lignite fields where the estimated reserves amount to 82 million tons. The present production of this mineral accounts for 82% of the total production in the country. It is mainly used for refining vegetable oils and for filtering and colouring petroleum products, mainly lubricants. Fuller's Earth is found at Kesardesar and Mundh in Bikaner district, Kapurdi, Alamarla and Sheo in Barmer district and Mundha in Jaisalmer district.

Other notable minerals are ceramic minerals and building materials occurring widely over the region : marble in the *Bagar* tract especially at Makarana in Nagaur district and a variety of minerals of lesser economic importance, e.g., asbestos, bentonite, soapstone, tungston, etc., mainly in Pali and Nagaur districts of *Bagar* tract and Barmer in the Marusthali.

From the view-point of the importance of the mining and quarrying in the economic activity of the region, Jodhpur, Sikar, Bikaner, Pali and Nagaur districts follow in order having more than 1% of the population employed in this activity.

Physical Resource Base

From the foregoing account it is obvious that the Rajasthan Plain suffers from several limitations of resources. Greater part of the region has been rendered useless by vast stretches of sand dunes in the Marusthali and by erosion in the *Bagar*. The climate is severe having high temperature and aridity. The vegetation is scanty in the Marusthali portion but there is fairly good pasture available in *Bagar*. The soil is intrinsically fertile, but suffers from lack of moisture.

If adequate provision of irrigation is made, large part of the region can be turned into good pasture lands and fertile cultivated fields. Irrigation is limited, as yet, to the Ganganagar district, which is now known as the granary of Rajasthan. Minerals are limited in quantity as well as in quality. This region has monopoly, however, in gypsum. There is possibility of the occurrence of oil and gas in the region. This region has some lignite, which is the only source of coal in Rajasthan. Rajasthan Plain has thus adequate potential resources, in relation to the low density of population, awaiting greater attention for proper management and exploitation in harmony with the physical, biotic and climatic conditions.

The Cultural Setting

Population

The total population of Rajasthan Plain is 6,471,060 (1961) having a density of 33 persons per km² as compared to 59 per km² for the state as a whole. Fig. 2.6 reveals that the population of this region is largely clustered in the eastern

and northern parts. The density of population shows a sharp decrease westward from *Bagar* land to the Marusthali, and within Marusthali the population is highly scattered and clustered around water points. This pattern of population distribution reflects the habitability conditions closely related to the availability of water. Even a little difference in the already low amount of rainfall affects the density of population, because it spells out the prospects for cultivation of crops or herding of cattle, the mainstay of livelihood in the region. It is further illustrated by the comparatively high density of population in the Ganganagar district in the north-western part of the region where the irrigation water has mitigated the hardship caused by lower amount of rainfall and has led to greater concentration of population. The density ranges from less than two persons per km² in Ramgarh and Som tahsils of Jaisalmer district to about 147 in Ganganagar tahsil (Fig. 2.6(a)). The general pattern of population distribution also reveals that in the semi-arid *Bagar* tract where intensity of sand dunes is moderate and some irrigation facilities by tanks and wells are available, the general density is more than 30 persons per km². Here also, the north-eastern portion (Sikar and Jhunjhunu districts) has 60-120 persons per km² owing to greater facility of irrigation by wells and tube-wells. The canal-irrigated areas in Ganganagar district have in general 60-120 persons per km². In contrast, eastern Marusthali has a density of 10-30 per km² while the western Marusthali has below 10 persons owing to progressively increasing intensity of sand dunes combined with extremely low and uncertain rainfall.

Growth of population : In spite of the arid and inhospitable environment, the population in Rajasthan Plain has been steadily increasing from 1921 onwards. There was general decrease in population everywhere during 1911-21 ranging between—0.09% in Churu district to—20.62% in Jaisalmer district, owing to large scale famine and incidence of disease. The highest percentage increase has been recorded in the last decade (1951-61) everywhere except in the Ganganagar and Bikaner districts where the highest figures

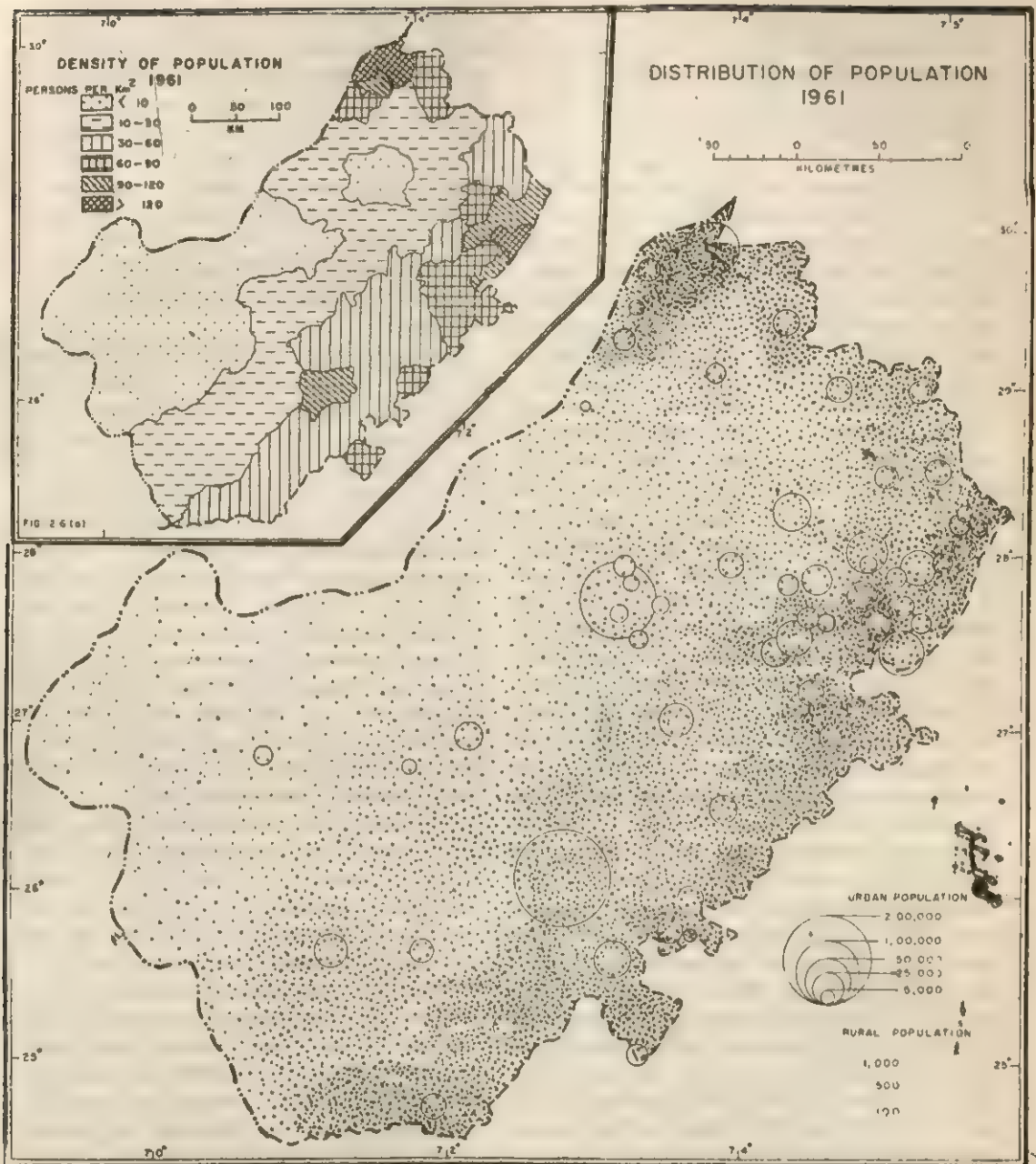


Fig. 2.6

were recorded earlier; Ganganagar recorded 102.49% increase in 1921-31 decade while the latter registered highest increase (34.29%) during 1931-41. During the last decade the increase in population varied from 21.29% in Sikar to 64.64% in Barmer district. The percentage

increase has been higher than the State average (26.14) in western districts (Ganganagar, 64 and Bikaner, 29.56) except in Jaisalmer (25.2) and Jodhpur (31.67) while it is generally lower in the eastern part. This increase may be due to progressively better relief measures against drought and disease as well as increasing reclamation and irrigation facilities in the western part, especially in the Ganganagar region. The increase in population between 1901-61 has been greater than the State average (95.80) in most of the districts, the most spectacular being that of Ganganagar (1623.24%). The percentage increase in Jaisalmer (86.6) and Nagaur (78.35%) is also quite appreciable, although a little below the state average. Considering the past trends of population increase, it is certain that the population will grow in this region at a rapid pace in the future, particularly because the ambitious desert reclamation projects may attract immigrants on a large scale in the region. The "Geometric rate of growth during 1961-66 (in Rajasthan) has been estimated to be of the order of 0.0485 which is roughly double the overall growth rate of the population during the last decade 1951-61".²⁷ This is enough indication of substantial increase to be gained in population of the region in subsequent years.

Population Structure : In the Rajasthan Plain the number of females is less than the males almost everywhere. The number of females per thousand varies from 802 in Jaisalmer to 964 in Sikar, against 908 for the Rajasthan state. The percentage of workers to total population is less than 50 in all the districts of the region. This percentage is lowest in Barmer (33.1) and highest in Jaisalmer (48.5). Among the workers, the majority of persons are engaged in agriculture. This percentage varies from 51.5 in Jaisalmer to 90.1 in Barmer. It is clear that the western districts of Bikaner (56.6%) and Jaisalmer (51.5%) have relatively lower percentage engaged in agriculture as compared to the eastern part where no district has less than 70%. This is because of higher percentage of people being engaged in livestock raising in the western parts. The percentage of rural population is also very high, being more than 80 in all the districts excepting

Bikaner (57.70), Churu (68.63) and Jodhpur (70.0). This, however, does not mean that the pace of urbanization is higher here than elsewhere but partly because of limited scope for rural living. The percentage of literacy is everywhere below 20, excepting Churu (23.19) and Bikaner (20.80). Ganganagar (16.82), Sikar (15.71), Jodhpur (18.57) districts have also higher percentage literacy than the state average (15.21), while Jaisalmer (8.11), Nagaur (13.26), Pali (13.61) and Jalore (7.46) have lower percentages.

Settlements

The people of Rajasthan Plain reside primarily in villages of different sizes. The density of villages reflects the density of population in general. For example, on an average, there is one village per 13 km² area in Ganganagar, 20 in Churu, 9 in Jhunjhunu, 14 in Sikar, 15 in Nagaur, 14 in Pali, 18 in Jalore, 32 in Jodhpur, 31 in Barmer, 50 in Bikaner and 80 in Jaisalmer. The size of the villages varies also from area to area as is evident from Table 2. The highest percentage of rural population lives in villages having 200-1000 population in Jaisalmer and 500-2000 population in Bikaner. In Jodhpur and Barmer the highest percentage of rural population resides in still larger villages, of 1000-5000 population size. In other districts the villages of moderate size (2000-3000) predominate.

The villages in Rajasthan Plain are generally of compact type with some variations in the degree of compactness in different parts. The compactness is the result of combination of physical and cultural factors. The limited and widely scattered patches of cultivable land and pastures and availability of water in favoured pockets and the need for cooperation in pooling the available human and technological resources for deriving the maximum from the limited and spatially concentrated resources on the one hand and for security against the marauders and aggressors on the other, have enhanced the sense of gregariousness and common living among the people. "Beset for centuries by the dangers of political instability e.g., organized banditry, confiscatory taxation, military looting and local tariffs, the whole population in general and urban population

TABLE 2

Number of villages and percentage of population living in villages of different sizes, 1961

District	No. of villages	Less than 200	200-499	500-999	1,000-1,999	2,000-4,999	5,000-9,999
Ganganagar	990	3.74	24.55	35.13	24.35	20.29	1.94
Bikaner	351	7.19	20.62	31.11	26.34	14.74	..
Churu	482	4.50	22.97	41.57	21.09	9.87	..
Jhunjhunu	278	1.78	11.74	28.80	29.37	20.49	7.82
Sikar	334	1.44	12.88	29.76	24.39	23.84	7.69
Jaisalmer	420	18.16	32.78	25.89	14.13	4.41	4.63
Jodhpur	311	2.11	10.31	23.36	29.58	30.15	4.49
Nagaur	626	2.95	17.21	30.79	27.48	16.48	5.09
Pali	370	2.08	11.14	22.99	27.19	28.85	7.75
Barmer	409	3.34	12.19	24.05	32.45	23.52	4.45
Jalore	220	1.01	11.60	28.00	33.55	22.66	3.18

Source : Census of India, 1961, Vol. XIV, Rajasthan, Part II-A, General population tables, pp. 105 and 107.

in particular has agglomerated for mutual protection in compact units.²⁸ The site of settlements is quite naturally governed by the factor of water supply, the source to be near enough to be easily tapped, although the actual siting, at least of sizeable and culturally important settlements, had to be necessarily located from the point of view of defence and security; for instance, many villages have been fort and/or walled settlements, and such forts have to be established on some physically and strategically vantage sites, even though the water source was somewhat away. "In many settlements the remains of the old forts still exist and the ruins of walls within which the local headman or Chief resided, and within which the villagers collected together for safety against passing armies, free-looters or tax collectors can be easily traced."²⁹ In several cases, the sites were also selected for security against flood hazards as on the nearest levee or high mound above the highest flood level. The following two villages located respectively in Marusthali and Bagar, illustrate the morphology and socio-economic characteristics of villages in the respective regions.

The village³⁰ lying in Pachpadra tahsil, district Barmer, is about 60 km from Jodhpur. The general topography of the village is flat and

the normal annual rainfall is 20 cm which is very erratic in nature. The water table varies from 45 to 60 m. Agriculture is the main occupation of the villagers. The average size of agricultural holdings is about 54 acres among agricultural castes and 26.7 acres among non-agricultural castes. The former castes keep large number of cattle whereas the latter have large number of sheep and goats. Among the total earners, 96.7% belong to the agricultural castes. The village has 405 households of which 126 live in the compact village core and the others in small compact hamlets and dispersed dwellings.

In the compact core (Fig. 2.7) families have been clustered by castes. Out of the 23 castes in the village 20 are living in compact blocks. Castes at the opposite ends of the hierarchy rarely live adjacent to each other. *Harijans* (Scavengers), *Bhambis* (Leather workers), *Jattiyas* (tanners), and *Bhils* (casual labourers and cultivators) always live on outer fringe of the village. The only exception are the *Dholis* (drummers) who were permitted by the Jagirdar to live near the centre. Such residential location is expressive of the social distance between them and the upper castes. However, also living at the outer fringes are *Brahmins*, *Ghanchis* (oil pressers), *Raikas* (Live-

stock raisers), *Darjis* (Tailors), *Lohars* (Blacksmith), *Darogas* (Rajput serving castes), *Nais* (hair-dresser) and *Sants* (religious service). The occupation



Fig 2.7 : Morphology of a typical desert village.

followed by the castes is important consideration in their residential location. Agricultural and stock-raising castes are found at the outer fringes, while the castes whose occupation does not demand much of outdoor life, live near the centre.

The other village,³¹ Kotri is located in Desuri tahsil of Pali District. It lies near river Sukri, known here as 'Undi'. Its topography is undulating. The village covers an area of about 2226.64

acres and has a population of 986 (1966). Agriculture is the main occupation. The area under cultivation is 1553.4 acres. Wells are the only source of irrigation. There are 40 wells dotted over the village area. Jowar and Bajra are the main crops.

The village has a nearby tank which provides water for various purposes. The houses are closely packed (Fig. 2.8). It reveals that the upper caste (Rajput, Brahmin and Chaudhary) occupy the central portion of the village, while the lower castes are settled on the fringes. The houses are square or rectangular in shape. The Rewari caste occupies more space because they need *Bara* (enclosure or the *Gher* of Haryana). The houses are generally built of mud or Kuchcha bricks with thatched or tiled roofs. The typical house has rooms on three sides while on the front there is only a mud wall with door for entering into the courtyard. There is some variation, however, in the number of rooms depending on the economy and castes.

Urban Settlements : There are 62 towns in Rajasthan Plain which are very unevenly distributed. In general, however, the towns are concentrated in the northern part of the region and thin out towards the Marusthali, obviously, in general conformity with such factors as water availability, lines of communication, density of population and economic advantages. Ganganagar (10), Churu (11) and Jhunjhunu (8) have nearly 50% of the total number of towns of the region. There are also some towns around Bikaner city, while the other districts have only 2 to 3 towns each, located widely apart; most of the towns are also small in size. There are only two cities, Jodhpur (224,760) and Bikaner (150,634) in the region of over 100,000 population. There are only two class II towns having over 50,000 population—Sikar and Ganganagar. The number of class IV towns is the highest (25).

Growth of Towns : There are varying regional trends of the growth of urban population. Towns of Churu, Sikar, Jhunjhunu and Jaisalmer districts experienced slow growth due to lack of any serious effort towards irrigation or industrialization and power supply. Insecurity as well

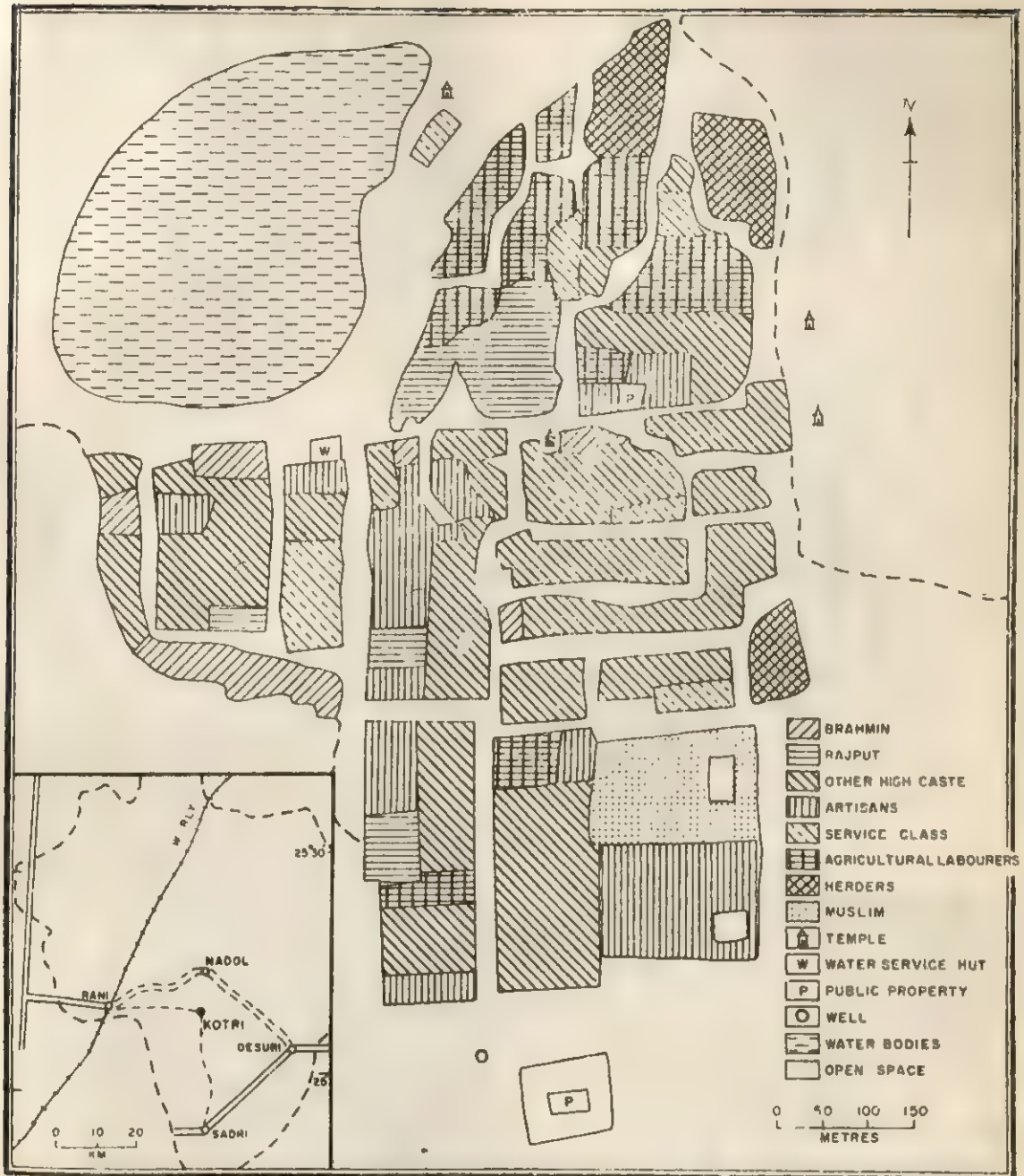


Fig. 2.8 : Morphology of Kotti village.

as lack of economic opportunities are also responsible for meagre growth rate of towns in the western part, particularly along the West Pakistan border; Barmer, however, is an illuminating exception, adding 32% to its population between 1951-61 due to heavy influx of po-

pulation from the surrounding villages of the district and from West Pakistan (Fig. 2.9). The northern canal-irrigated tract growing such cash crops like wheat, cotton, sugarcane and oilseeds in Ganganagar district is undergoing an accelerated urban population growth : towns like Hanumangarh, Sangaria, and Ganganagar experienced

an increase of above 162, 109 and 75% respectively during 1951-61. Many *wandi*, Canal-and agro-industrial towns are emerging and are appending to them rural service functions also. It is worth noting that rural population recorded a rise of 61% during 1951-61 in Ganganagar district, the per km² density increasing from 11 to 27.



Fig. 2.9 : Morphology of Barmer.

TABLE 3
Distribution of Towns by Class (1961)

District	I	II	III	IV	V	VI	Total
Jaisalmer					2		2
Barmer			1	1			2
Jodhpur	1			3			4
Nagaur			2	4	2		8
Jalore				2			2
Pali			1	2		1	4
Sikar		1	1	2			4
Churu			4	4	2	1	11
Ganganagar		1		4	3	2	10
Jhunjhunu			2	2	4	1	9
Bikaner	1			1	4		6
Rajasthan Plain	2	2	11	25	17	5	62

Earlier most of the towns originated as strong points of regional military and political control and administration. It was really with the establishment of a feudal system of society and the division of the area into a number of small states, ruled over by local tribal chiefs (and princes) that conditions became favourable for the growth of towns and small cities.³² The centripetal force acting to concentrate the population was the high-walled residence or the fort of the ruler (locally known as *Garb*) surrounded by the quarters of a large group of professional warriors. Such centres or *garb* had at least three main advantages. They furnished some degree of protection in a period when internecine warfare was a scourge, and they afforded to a greater degree than was possible in a village, opportunities for work and

amusement. Thus, most of the towns in this region originated as strategic political-social centres of small semi-independent territories. Artisans and traders gravitate to these centres and in a number of instances a centre became so specialised in some features of trade, commerce or manufacture as to acquire considerable fame in course of time. The old capital towns of Tonot (Jaisalmer), Mandor (Jodhpur), Bagor (Bikaner), Jalore, Nagaur etc., originated as administrative centres of regional importance to which other functions were appended later on. The names ending in *garh* express the intrinsic strategic importance of the site and nature of military and/or political origin of towns, such as Suratgarh, Ratangarh, Rajgarh, Lachhmangarh. Other names also with such endings as *ner*, *pur*, *Shahr*, *Nagar*, etc., (all meaning settlement or town) and the names of the founders mostly speak for their political or administrative origin, although in later times some of them were located for economic advantages as market towns. For instance, Bikaner was founded by Rao Bika (1489), Jodhpur by Rao Jodha (1459), Sardarshahr by Maharaja Sardar Singh (1851-1872) and Ganganagar by Maharaja Ganga Singh (1898). Some names ending in *Mer* (meaning rocky) show the unique physical characteristics of the site; Jaisalmer, for example, is situated on a rocky basement. Many other towns had similar origins although their names do not directly speak for the founders' names or even other unique characteristics.³³

Analysis of sites of some towns will explain their intrinsic advantages for defence and control as much as having dependable water supply and other advantages such as safety from sands and dust storms for sustaining urban life. Barmer clings to a hill (415 m), Jaisalmer lies by the side of the famous three-peaked hill—Tributi, while the largest city of the desert, Jodhpur is sheltered by hills on three sides, their peaks rising to 300-450 m above sea level and 120-210 m above the general level of the surrounding country. Some towns have originated and developed because of the availability of minerals or salt deposits. Salt-pans or *sars* where salt deposits are thick enough to be of commercial value, have

given rise to many urban settlements in this arid land. A number of settlements which are located near such salt deposits derive their significance from salt, and a few of such settlements have become important salt-producing centres. The importance of such settlements has declined but quite a number of them still retain their names which end with *sar* (meaning salt lake), viz., Napasar, Lumkaransar, Bhinasar, Rajaldesar, and Bachasar. Mining industry has led to the establishment of some towns like Gudha (salt), Lumkaransar (gypsum), Makrana (marble), Jamsar, Palana, Baru, etc., in the region. In some cases railways, roads, mining, industry and other factors have stimulated the growth of the old declining settlements; Deshnokh in Bikaner district may be cited as an example. Most of the large towns have been linked with railways which have boosted their growth, such as Jodhpur, Bikaner, etc., while some old straggling settlements have been raised to town status, i.e., Anupgarh, Hindu-malkot, Gajsinghpur, Karanpur in Ganganagar district. Since independence, the industrialists having soft corner for Rajasthan have made some successful efforts in establishing industrial and educational institutions leading to the development of well-planned townships. Notable among these is Pilani, a technological educational centre. The canal colonies or towns, developing in the canal irrigated areas of the north, are other adjuncts to the urban fabric of Rajasthan Plain.

The morphological patterns of the towns of the Rajasthan Plain resemble the general pattern of the villages, both partaking similar physical and functional characteristics although in varying degrees. "There are walled villages and walled towns, market villages and market towns, track-junction villages and cross-road towns.....³⁴, etc. and many are generally amorphous or irregular in shape, particularly at the core.

Fort, shrines or temples and walls are characteristic cultural features and dominate the morphological patterns of the towns. Irregularity of the plans stems from the uneven sites on high mounds, or by the side of an isolated hill or a depression since they provided unique advantages for fortification and defence as well as availability

Larger towns, however, show distinct signs of a modern city explosion, developing typical inner, middle, outer and suburban zones and also throwing their tentacles along the regional routes. Jodhpur and Bikaner are examples in point. In many towns *mandis* and business and industrial cores are fast becoming the cultural dominants rather than the old temples or forts which are now astride the economic or even political functions of today. Apart from the above factors, some settlements have developed because of famous temples. The arid region has been important for Jainism since ancient times. This gave rise to the establishment of a few settlements to which traders and merchants have been attracted by the market advantages, offered by numerous pilgrims. Ramdeora is one of such settlements.

*Morphology of Phalodi Town:*³⁷ Phalodi Town (Pop. 15,722) located in the central part of the Rajasthan Plain, typifies a desert town. The name 'Phalodi' has been derived from the Phala Temple (Fig. 2.10). Temple and the fort are the two dominant features of the town. Except for the residential areas, which cover a major part of the town, the business areas are mainly concentrated near the fort from the defence standpoint. One railway line and a road connecting Jodhpur and Jaisalmer cities pass through Phalodi. This road is the only outstanding means of transport. As a consequence, industrial areas mostly lie along the road and near the railway station. Educational and administrative areas are mostly confined to the south-eastern margin of the town. There are a few play-grounds and parks lying outside the town. The whole town characterizes a compact-type settlement, roughly following concentric zone development.

Economy

Agriculture and livestock-raising are by far the most important economic pursuits of the people; however, processing and manufacturing industries, household industries and mining are of increasing significance since independence.

Agriculture is the main occupation of the overwhelming majority of population in Rajasthan Plain. The land use of the region reveals that

the people derive their sustenance from a very low percentage of land, the net area sown being less than 40% in Jodhpur Division. Pastures, culturable waste and fallow lands have strikingly high percentage covering about 60% of land in Bikaner and 48% in Jodhpur division. Besides, about 20% of land in the latter is unculturable. These features of land use show greater spatial variations on district level (Fig. 2.11). The districts lying in the Bagar tract have high percentage of net area sown, generally above 60 and about 75 in Jhunjhunu district. Other districts in the northern and eastern parts, Sikar (69.4), Churu (67.7), Nagaur (65.8), Ganganagar (64.4) and Jalore (63), have above 60% area in this category. This figure, however, decreases sharply towards the Marusthali. It drops to about 49% in Barmer and Jodhpur. Bikaner and Jaisalmer districts, forming the heart of Marusthali, have only 20.6% and 5.1% of the total respectively. The percentage of uncultivated land comprising mainly of cultivable wastes and pastures is naturally the highest in the westernmost districts, being above 65% in Bikaner and 46% in Jaisalmer. In all other districts, excepting Ganganagar (25), Barmer (17.5) and Churu (10.6), it is below 10%. In addition to high percentage of cultivable waste, Jaisalmer has also very high percentage of area not available for cultivation (43%) presumably because of high incidence of sand dunes which is recorded as barren land. The area not available for cultivation is generally below 20% in most of the districts, particularly in Pali (17), Jalore (12.2), Sikar (11.32) and Jodhpur (10.3), where a considerable proportion of the area is affected by gully erosion and also forms bare rock exposures. The percentage of fallow land varies from 3.8 in Jhunjhunu to 34.3 in Jodhpur. Barmer (25.4), Pali (23.9), Nagaur (20.3), Jalore (17.7) and Churu (16.0) also have comparatively high percentage of land under fallow.

The cropping pattern of the region reveals that cultivation of cereals is most important. Among the cereals, millets like Jowar and bajra predominate in both acreage and production in the southern and western parts while in the north eastern portion also they cover more than 1/4 of

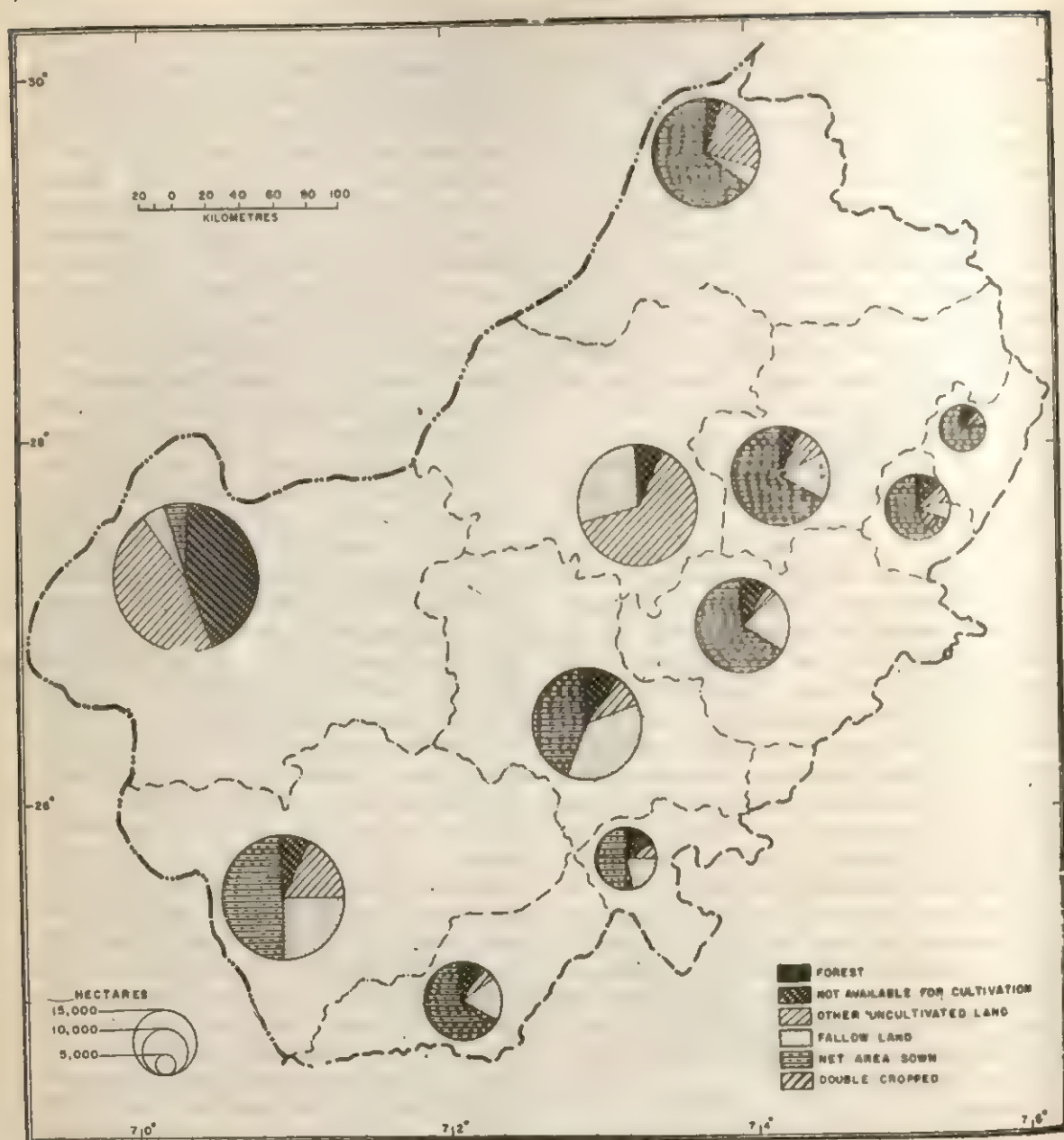


Fig. 2.11 : Showing Land Use.

the total cropped area except in Ganganagar. Gram and pulses, however, replace the millets as the most important crops in the northern part (Ganganagar, Bikaner, Churu, Sikar, and Jhunjhunu) of the region but even in these areas millets hold next important position except in Ganga-

nagar where wheat, barely and maize come next to gram and pulses followed closely by millets. Gram and pulses constitute the second ranking crops in Nagaur, Jodhpur and Barmer whereas in Pali and Jalore, millets are followed by wheat and barley. Among commercial crops, oil-seeds

are of some importance in Pali, Jalore, Nagaur and Jodhpur. Cotton and sugarcane grow predominantly in Ganganagar.

Thus, it is obvious that there is greater diversification in cropping pattern in Bagar in comparison to the Marusthali where the number of crops decreases with increasing predominance of millets. This pattern is explained by increasing aridity and decreasing facilities for irrigation towards the west. The regional disparities in the pattern of land utilization, irrigation and soil-types are manifested in the regional cropping patterns.³⁸ The Ganganagar district, where canal irrigation is available, there is greater diversification of crops. In the northeastern parts well irrigation is available while in the south-eastern part wells and tanks are sources of irrigation.

TABLE 4

District	Percentage of Irrigated Area to Total Cropped Area
Barmer, Jaisalmer, Bikaner, Churu.	<1
Jodhpur, Jhunjhunu, Nagaur	1—5
Sikar	5—10
Pali	20—30
Ganganagar	>30

It is clear from the above discussion that the characteristics of land use and cropping pattern are closely related to the availability of water in this arid environment. The "average size of holdings is large. The land in this area cannot be cultivated intensively and only those crops are grown which require less moisture and which can survive arid and semi-arid conditions. These crops are hardy and require comparatively little attention and labour."³⁹ In this region *bajra* is the main foodstuff and is the most dominating crop. The cultivators have to cultivate much larger area for their sustenance owing to comparatively lower yield per acre.

Agriculture in the region is poor and precarious. The land is always in the actual grip of famine or in the dread of it. It is further handicapped by the occasional locust visitations. The main problems of agriculture in the region arise

from paucity of moisture, salinity, alkalinity and soil erosion and plant diseases and pests including frequent locust invasion.

In the western part of the region, the farmers, through their long experience, have developed certain techniques which are excellently suited to conservation of soil moisture. "The practice of preparatory tillage is widely carried out. The farmer ploughs the fields before the advent of the monsoon and thus opens the hardened crust of the soil to absorb a maximum amount of rain-water. The indigenous wooden plough is probably the best suited for preparatory tillage."⁴⁰ Stubble mulching in the *bajra* field can be successfully practised in this region, specially where evaporation of moisture from the soil poses serious problems. A crop sequence which reduces the loss of moisture from the soil and helps in the more economic use of conserved water is most suitable. Application of fertilizers is essential for crop cultivation in the arid regions to meet the deficiency of plant nutrients wherever irrigation facilities may be available. Strip cropping and fallowing are some of the other measures adopted in this region. The infestation of pests like *Katra* is another problem in arid lands. These pests consume the vegetation and loosen the soil accelerating the process of soil erosion. The menace of locusts can be controlled by direct offensive, changing the special ecological conditions which favour their growth, and checking their outbreak. The use of hydrocarbons and spraying machines have rendered control operations quite effective. Suppression of outbreaks is possible by the destruction of locust concentrations before they develop into swarms.⁴¹

The model Suratgarh farm⁴² of the Government of India at Suratgarh (29°20' N. and 73°54' E) in the Ganganagar district is located in the valley of the Ghaggar, and covers 30,760 acres of land. The farmland is reclaimed from the former sand-dune-infested and rough pasture land. It was started on Aug. 15, 1956 as a modern, fully mechanized farm with Russian equipment. The soil is alluvial (hard clay and clay loams with pH 10) and fairly productive. The cost of reclamation was also not high.

The area also had the additional advantage of good means of transport and communication. Climate provides hazards in agriculture. The area is typically in the arid zone, the average annual rain being only 11.5 cm, liable to yearly and seasonal variation with a wide margin. In the exceptional year of 1960, 11" (22.5 cm) of rain fell in 3 days and only about 4" (10 cm) during the remaining part of the year. January temperature goes down to 5°C and frosts are not uncommon while the summer temperature may rise to 50°C, occasioned with excessive sandstorms; the severe ones may continue as long as 48 hours. Excessive heat and hot dry winds parch the vegetation and minimize the soil moisture.

About 97% area is under cultivation. The farm has a diversified land-use; about 2000 acres are marked for orchards and 1500 acres for animal husbandry.

Surface water is scarce and the water table is deep, as much as 45 m, and is discontinuous. Water is also brackish. The field agriculture is not possible without irrigation, not even dry farming. By the use of various means such as pumping sets, and the controlled use of water, as by sprinklers, the farm acreage could be put under cultivation, 6,000 acres only in the first year, 14,000 acres during 1958-59 and over 22,000 acres in 1961-62. Apart from *Kharif* (paddy, bajra, jowar and maize) and *rabi* (wheat, barley, gram, mustard, etc.) crops, the farm also grows sugarcane, pulses like *moong*, *arhar*, etc., and potatoes and other vegetables. Green manuring is a very important and necessary practice on this farm. Although there have been fluctuations in production due to vagaries of rainfall and deficient planning at times, the farm has been now a profitable enterprise, and it has earned a national fame for producing quality seeds in large quantities. The farm is also an exercise in efficient farming technology and agronomic management : it has its own machine-shed, godowns repair-shops and sales unit. It has also a separate cattle-shed for animal husbandry and dairy section : it plans for breeding superior bullocks of Haryana and Murrah breeds of cattle, and pedigree rams of Bikaner to help increase the quality wool

supply. There are also poultry and apiary sections. Thus, the farm is efficiently running and has been quite successful in boosting the regional economy by its quality seed distribution and by setting an example in agro-economic management.

Livestock : raising is the most important occupation as subsidiary and supplementary to cultivation in most parts of the region. A large number of people almost entirely depend on livestock raising for their livelihood. The Table below gives the percentage of livestock by districts :

TABLE 5

District	Cattle	Buffaloes	Sheep	Goats	Camels	Others
Barmer	12.1	2.9	11.0	24.8	15.5	22.4
Bikaner	9.0	3.8	7.7	2.9	7.6	3.2
Churu	5.9	11.2	5.2	6.9	14.6	3.5
Ganganagar	8.2	18.6	5.1	6.4	18.4	10.7
Jaisalmer	5.8	0.8	9.7	5.6	7.2	10.8
Jalore	8.7	9.3	8.6	8.9	3.4	9.2
Jhunjhunu	4.2	9.1	3.4	6.7	8.9	6.4
Jodhpur	12.2	5.5	13.6	6.3	8.4	5.0
Nagaur	13.6	11.4	13.3	7.6	6.3	6.2
Pali	13.6	16.7	16.5	14.6	3.0	14.2
Sikar	6.7	11.3	5.0	9.3	6.5	7.5

It is apparent that cattle, sheep, goats, camels and buffaloes are the important animals raised. Cattle are numerically the most important in the northern part (Bikaner, Ganganagar, Sikar, and Jhunjhunu). Nagauri cattle are of all India fame for fine breed. Sheep are the most important in Jaisalmer, Churu, Jalore, Jodhpur, Nagaur, and Pali, while goats gain importance in Barmer where they account for nearly one-fourth of the regional total. Camels and buffaloes are important in almost all the districts. The desert region comprising of the districts of Jalore, Barmer and Jaisalmer has predominance of draught animals, sheep, goats and camels. Camel is naturally more widely spread as beast of burden and draught animal throughout the region, excepting Ganganagar where buffalo is as important owing to easy availability of water particularly required for the latter and partly also because of the proximity to Haryana. Barmer in this region

has the maximum number of livestock, mostly sheep and goats, which alone account for two-thirds of the total. The livestock population of the Jaisalmer district also contains 68% sheep and goats while buffaloes constitute less than 0.02%.⁴³

The following breed of cattle are notable in different districts :

Nagauri : is found in the districts of Nagaur, eastern parts of Jodhpur and Nokh tehsil of Bikaner. The animals are purely of draught type. *Kankrej* : is found in Jalore, Pali and parts of Barmer district, and is one of the heaviest cow breed in India. The *Tharparkar* breed is famous for high milk-yield capacity and draught capacity. It is found in Barmer, Sanchore tehsil of Jalore district, eastern Jaisalmer and western Jodhpur. *Rathi* breed is found over a tract extending from north-eastern Jaisalmer to western and south-western Ganganagar district in the north and is good in dairy but poor in draught capacity. *Haryana* breed is common in Ganganagar, Churu, Bikaner and Sikar districts. It is a very useful dual purpose animal.

Sheep are of eight different breeds, viz., *Nali*, *Angul*, *Malpura*, *Jaisalmeri*, *Chowkila*, *Magra*, *Marwari* and *Sardiril*. The *Chowkila* is the best for quality wool, although the wool of other breeds is also suitable for carpets.

In the arid and semi-arid region Marwari and Lohi breeds of goats are notable for mutton.

This region has monopoly for the best breeds of the camels, the most important of which are the Bikaneri and the Jaisalmeri.

"The livestock industry is based on unselected animals of rather poor quality and productivity. This is done by minimum of capital and running costs. The extent to which improvements could be done depends on the economic and social structure of the industry and mainly the ownership of the land. In many cases, the flock and herd owners do not often individually own the land over which their daily grazing routines or their nomadic movements and migrations take place. In the migratory system, the herdsmen or other units generally have a settled area where perhaps some good crops can be grown and where older people remain while the more mobile mem-

bers of the community take the stock on their seasonal migratory routes. This period varies from a few weeks to several months, mainly during the summer months of April, May and June. People engaged in animal husbandry have accepted the fact that the critical years mean considerable losses. Even in years of normal rainfall, the nomads and their cattle suffer considerably because of scarcity of drinking water in summer months of April to June. When the rains fail, the herdsmen are forced to migrate hundreds of kilometers in the east and in other parts of Rajasthan where grazing lands and fodder are available. In this forced movement many cattle die because of water scarcity. The Rajasthan canal will serve to improve the economic condition of these people with plentiful supply of drinking water in the area."⁴⁴

Industry : The region is industrially one of the most undeveloped regions in India. There is negligible proportion of population employed in industries although the number of factories is considerable in some of the districts (Table 6). It means that most of the factories in the principal towns are of small scale, processing local raw materials or manufacturing light consumers' goods. The princely states helped in the past to develop a number of handicrafts mainly in urban areas. This state of industrial development is due to lack of raw materials and infrastructural development. As has been indicated earlier, agriculture in the region is poor and precarious with hardly any surplus. The commercial crops have little importance. As such, although the economy is essentially agricultural, agro-based industries have not been well developed. There is dearth of ferrous and non-ferrous minerals and power resources. Means of transport are also limited. Towns are small and scattered and only large cities such as Bikaner, Jodhpur and now Ganganagar account for a substantial part of the employment generated by such industries. In fact, most of the even small units of production are naturally concentrated at the district headquarters where facilities of power, water supply and means of communications are provided easily.⁴⁵ Only in northern part of



Fig. 2.12 : Showing Industries and Roads.

the State some raw materials for agro-industries such as cotton and sugarcane, etc. are available (Fig. 2.12). Hydro-electricity from Bhakra, combined with railway transportation, provides impetus for the growth of agro-based industries in this part. Ganganagar, therefore, has the highest number of factories and persons employed in industries, mainly agro-industries such as flour mills, cotton-seed oil, textiles, and sugar. Next in importance comes Jodhpur where the city located at the borderline of the Bagar and the

Marusthali draws raw materials from the vast area. The textiles (woollen and cotton) and chemical industries are also notable. Bikaner also has more than 100 factories manufacturing woollen goods, carpets, glass, iron and steel pipes and other miscellaneous products. The lignite and gypsum deposits have also provided some impetus for industries here. Other districts have insignificant industrial activity. Although Rajasthan has made rapid strides in industrial development during the last two decades, most of the

development has taken place in the eastern part where a variety of raw materials are available and infrastructure is better developed. Marusthali has remained comparatively neglected by and large in this respect. Salt industry, however, deserves special mention in this region.

TABLE 6

Districts	Registered factories in 1964.	
	Nos.	Persons employed.
Jalore	10	50
Barmer	6	50
Jaisalmer	1	22
Jodhpur	135	6,317
Bikaner	108	4,043
Nagaur	38	883
Churu	7	42
Jhunjhunu	4	67
Sikar	9	187
Ganganagar	180	6,664
Pali	67	3,320

(Source : Report on Regional Transport Survey of Rajasthan 1966.)

Salt Industry : The Pachpadra salt producing area is the most important in Rajasthan. Other major salt works are located at Sambhar and Nawa in the Sambhar salt lake area, at Kuchman near the Kuchman lake and at Didwana near the Didwana lake. The Pachpadra salt works are located about 128 km south-west of Jodhpur. The salt source consists of a depression with an area of about 83 km.² The rain water leaches out the salt from a catchment area of about 910 to 1,040 km.² and carries it to the sub-soil zone in this depression. The largest number of salt pits are in the western part of the depression worked out at Hiragarh and Bara Sambra, while Posali and Chhota Sambra salt works have developed in the eastern section of this depression. The salt at Pachpadra resembles more the sea salt.⁴⁶ Another significant area for salt production is Didwana. It is situated 50 km north-west of Sambhar lake and covers an area of about 50 km.² The depression is surrounded by the sand hills on three sides except in the west where an isolated spur marks its western boundary. The "Didwana salt-producing area has great potentialities for salt manufacturing in the state. Here the salt can be produced at a cheaper cost than in the other two areas. This source is not dependent on rain-fall and thus the level of production can be maintained even in drought years".⁴⁷ Other minor salt works are located at Phalodi, Pokaran, Degna, and Sujangarh.

Transport : Rajasthan Plain is served by metre gauge single track railway (Fig. 2.13). The main line connecting Delhi and Ahmedabad runs along the eastern margin while the Ganganagar-Bikaner-Jodhpur-Kandla line traverses through the middle of the region. There are several inter-connecting rail links in the north-eastern part but in the south-western part Jodhpur-Pokran-Jaisalmer and Jodhpur-Barmer-Munabao are the only two routes linking the vast desert in the west to the eastern parts. Roads are poorly developed in this region. Only a few main roads connect Bikaner and Jodhpur to the other important cities of Rajasthan. Other roads have mostly gravel or *kachcha* surface and through inter-city connection is difficult. The density of roads is quite low. The road kilometerage per thousand km.² of area varies from 0.2 in Jaisalmer to 1.03 in Pali. Sikar, Pali and Nagaur all in the Bagar are the districts having higher road density than the average for the State (0.86). The degree of accessibility is naturally very poor. Vast inaccessible tracts lie in the Marusthali region. Sand dunes pose a great problem in the use of even the available roads. Sometimes even the railway tracks are buried under sand after a severe sand storm and transportation is disrupted for days together. The air transport is quite insignificant.

The traffic density on railway lines is generally low excepting on the main lines, which have considerable bridge traffic density. Freight traffic is not significant on the roads although it is increasing.

The Regions

The Rajasthan plain displays great variations in geographical features. As such, it has been divided into 2 first order, 7 second order and 18 third order regions (Fig. 2.14). The first order



Fig. 2.13

regions have been divided on the basis of physical factors, particularly topographical and hydrological, which underline the basic differences between the Marusthali and the Bagar. The previous discussion of different elements has revealed sharp variations between these two regions. Marusthali is characterized by high intensity of sand dunes, below 25 cm of annual rainfall, very sparse population, widely scattered rural

settlements, significant concentrations of population in urban areas, high percentage of cultivable waste and fallows and very low percentage of net sown area, mono-culture of millets and general absence of industrial activity owing to comparatively poorer resource endowment and infrastructural development. In contrast, the Bagar region is relatively free from sand dunes, is less sanded-over and has higher (25-50 cm)

rainfall. It has also greater percentage of area under irrigation resulting in the higher percentage of net sown area. The cropping pattern is relatively diversified. The density of population and settlement sharply increases and clusters of towns are well marked, particularly in northern parts. Each of these two broad regions has considerable variations in the details of geogra-

phical elements on the basis of which lower order regions with fairly uniform features have been outlined and their distinguishing characteristics are discussed in the sequel.

1a. *Jaisalmer Marusthali* is the driest part of the region having most adverse environmental conditions resulting in the lowest density of population (4 per km²). The net sown area is

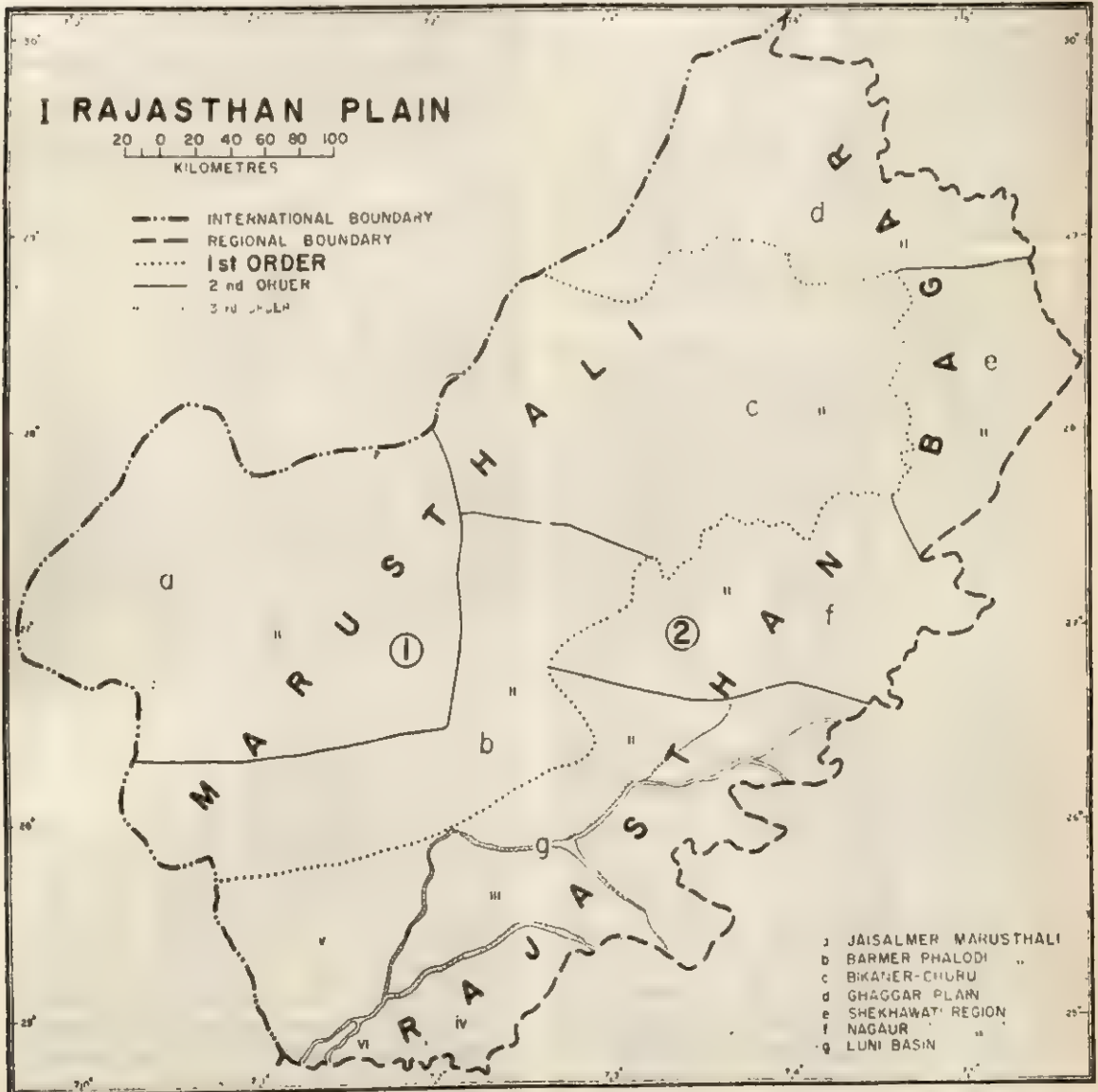


Fig. 2.14

as low as 5% of the total and the percentage of culturable waste and fallows is the highest (Fig. 2.11). Livestock raising is the main occupation of the semi-nomadic people. Tharparkar and Rathi cattle are raised here. Jaisalmer (8,362) and Pokaran (5,284) are the only towns in this region. This region can be further divided into two sub-regions: (i) the Western Jaisalmer plain, the driest part, having no town at present, is likely to get irrigation facility from the Rajasthan canal. It promises good possibility for economic development with considerable irrigation not unlike the Ganganagar district in the north. (ii) The Eastern Jaisalmer plain has a somewhat more diversified economy with gypsum deposits. It is linked by rail to Jodhpur and exports gypsum through it. If Rajasthan canal is extended to this area, the prospects of its development will be brighter for an agricultural-pastoral-mineral economy.

1b. *Barmer-Phalodi Marusthali* is also dry. Its economy depends entirely on cultivation and livestock raising. The irrigation possibility is limited to exploitation of ground water. The density of population and intensity of cultivation are low. "This region may experience a boom in its economic activities if the operation and exploitation of mineral oil and gas become successful".⁴⁰ Barmer (27,600) and Phalodi (15,722) are the two towns linked by rail to Jodhpur. This region is sub-divided into (i) Barmer region and (ii) Phalodi region. The former has concentration of gypsum, bentonite and ceramic minerals around Barmer whereas the Phalodi plain has no mineral deposits.

1c. *Bikaner-Churu Marusthali* is distinguished from the other parts of Marusthali by its relative economic prosperity. Here the percentage of net sown area is much higher and the cropping pattern is comparatively diversified, the higher percentage of cropped area being devoted to gram and pulses followed by millets. There are good deposits of gypsum, lignite, Fullers' earth, glass sand and ceramic minerals. Hydroelectricity is available here from the Bhakra system. There is greater concentration of industries and towns in this region. It is sub-divided into (1) Bikaner plain and (ii) S.E. Churu plain. The former has

more diversified economy, there being concentration of industries and mineral exploitation. Greater part of Bikaner plain will be covered by the Rajasthan canal and hence it has good prospects for a still more diversified economy. Bikaner (1,50,634), Gangasahar (10,696), Bhinasar (5,442), Nepasar (6,634), Desnoke (6,880) are the principal towns in the Bikaner plain. The South-eastern Churu plain, in contrast, has to depend entirely on agriculture. Sardar sarahar (32,072), Dungargarh (16,323), Ratangarh (26,631), Rajaldesar (10,980), Vidhasar (9,389), Chhapar (7,255), and Sujangarh (30,761) are the towns in this plain.

2d. *The Ghaggar Plain* covers the Ganganagar district. It is distinguished by its canal-irrigated agricultural and agro-based industrial economy. The agriculture is intensive having diversified cropping pattern. This is the only region in Rajasthan plain where significant percentage of the cropped area is devoted to cash crops such as cotton, sugarcane, and oilseeds. Gram and pulses, wheat, barley and millets are the cereal crops in order of importance. Agro-industries like flour milling and textiles have grown up on the basis of mostly local raw materials. The population density is quite high. Transport facilities are also good. There has been a rapid growth of towns in the region recently. Ganganagar (63,854), Nohar (13,728), Karanpur (11,511), Bhadra (10,000), Raisinghnagar (9,493), Sangaria (8,112) are the main towns. The region is divided into two sub-regions, (i) Ganganagar plain and (ii) Nohar-Bhadra plain, mainly on the basis of the level of agricultural development. The latter is an unirrigated tract and has, therefore, subsistence agricultural economy.

2c. *Shekhawati Region* is characterized by agricultural economy dependent primarily on well and tubewell irrigation. Gram and pulses are the leading crops though millets also account for nearly 1/4 of the total crop-acreage. This region has a network of railway and roads being the passageway between Rajasthan, Haryana and Delhi. It receives hydro-electric power from Bhakra. All these have contributed to a high density of population and concentration of several small towns namely Churu (41,727), Ratangarh (4,363),

Taranagar (10,406), Jhunjhunu (24,692), Madwa (8,290), Bagar (7,194), Chirwa (12,925), Pilani (11,565), Surajgarh (8,401), Nawalgarh (24,911), Mukundgarh (8,144), Sikar (50,636), Lachhmangarh (18,484), Fatchpur (27,035) and Ramgarh (13,956). This region has been divided into two sub-regions on the basis of the degree of concentration of towns and general economic growth : (i) The N.E. Churu region has only four towns, while the rest are concentrated in (ii) the Western Sikar-Jhunjhunu plain.

2f. *Nagaur Region* is distinguished by an inland drainage system, salt lakes and rocky and hilly surface areas. This region is transitional between the more humid Luni basin on the south-east and the comparatively arid north-east Bagar. Here millets become the first ranking crop covering more than 50% of the total cropped area although gram and pulses also cover about 25%. Marble, building materials and gypsum are available here. The region is famous for its salt industry, several lakes including the Sambhar, the Didwana and the Degna being the chief sources. Ladnu (23,825), Didwana (13,547), Nagaur (24,256), Kuchman (15,458), Nawa (8,097), Makarana (17,270), Parabatsar (5,081), and Merta (13,083) are the main towns. The sub-regions have been recognised on the basis of the primary economic activity : (i) The Sambhar-Didwana region has mainly salt industry whereas (ii) the Nagaur-Osian region is mainly agricultural having good mineral resource potential also.

2g. *The Luni Basin* is the most distinct region having a relatively developed drainage system. This is the most humid region in Rajasthan plain. The percentage of net sown area is the next highest after the Ganganagar district, being supported by tank irrigation. Millets are the most important crop followed closely by wheat and barley; oilseeds also become important in this region. The population density is comparatively high. The region is, however, lacking in minerals of economic value, and industrial development is negligible. Jodhpur (2,24,760), located on the western margin of the region is, however, an important industrial centre. Other towns are Pipar (12,557), Bilara (12,171), Sujat-

road (4,434), Siyal town (16,548), Pali (33,303), Sadri (12,595), Balotra (12,110), Jalore (12,822) and Dhimal (11,832). This region is divided into six sub-regions reflecting primarily the variation in hydrological conditions. The northernmost region namely, (i) S.E. Jodhpur plain is an area of inland drainage and forms the transitional belt between the Bagar and the Marusthali. (ii) The Pali-sujat plain lies in the upper Luni basin. (iii) The Luni-Sikri interfluvium has comparatively undulating terrain. (iv) The Jalore-Bhimtal plain is drained by several small tributaries of the Luni, the Jawai being most important of them. (v) The Luni Rann region is characterized by greater salinity being near the Rann of Kutch. (vi) The S.E. Barmer plain is comparatively arid.

Problems and Prospects

The foregoing discussion highlights the natural resource scarcity and economic backwardness of the region. The economic prospects, however, are not so dismal, provided efforts are made to mitigate lack of natural resources by infrastructural developments; for as indicated, the soil is intrinsically rich and the problem of over-population has not arisen so far. The agricultural density is still very low, being below 20 persons per hundred acres of land available for agricultural uses⁴⁹ in Bagar tract, and below 10 persons in the Marusthali, indicating great scope for agricultural prosperity, provided water, the single vital element, is made available. With the completion of the Rajasthan canal project which proposes to irrigate about 1.2 million hectares of arid land in Bikaner and Jaisalmer, this desert may be turned into productive land. The intensity of irrigation is proposed to be 33% during *kharif* and 45% in *rabi* season.

After taking off from the Harike barrage at the confluence of the Sutlej and the Beas rivers in Punjab, Rajasthan canal enters Rajasthan Plain near Jandwala village of Hissar district. The main canal branches off into the Luluah branch at 485 km of Rajasthan portion and thus it will complete a total length of about 805 km from the Harike head-works. The total canal system will consist of the main canal, nine branches,

three lift channels and 21 direct distributaries and a large number of small channels. It is expected that the whole project would be completed by 1971 and full development of irrigation would be possible in about six years in Ganganagar and Bikaner while in other areas it may take ten years.³⁰ Similarly there is scope for bringing further area under irrigation in the Luni and the Sukri valleys in Bagar tract. The estimated water potential in the former is 28,300 million cft. In the Sukri valley medium and some minor projects are proposed to make use of the possible run-off of 1,840 million cubic ft. Tubewells may be bored in the north eastern parts where Bhakra electricity is available. Also in the Marusthali the prospects for ground water resources are promising (Fig 2.15). The Lathi Basin (Jaisalmer district) is a hydrologically potential area. Its economic viability is yet to be precisely determined; while in the Bikaner district the tertiary sand-stones occurring in three distinct patches between (i) Phalna-Nepasar, (ii) Sujandesar and (iii) Muktanagar-Beechwal area have been proved to be potential source areas of ground water for future development.³¹ The provision of irrigation facilities will increase the cropping intensity in the Bagar by making possible double cropping while in the Marusthali vast tract of cultureless waste and fallow lands can be brought under cultivation and pastures. Special efforts should

be made to introduce drought-resisting grasses, particularly in the Marusthali where rain-water is scarce, irrigation facilities highly limited and soil moisture meagre. Such grasses could help in the ecological change, locally or regionally with time. Marusthali has already some important grasses such as *Aman*, a nutritious grass for the cattle which grows four to six feet within a matter of days after a good shower. Other grasses also need be tried in the Marusthali to improve the pastures and grazing lands and attempts should also be made towards growing livestock feed-stuffs. *Gaura* or cattle feed is an important crop higher production of which is possible and it may be an important industrial raw material also.³²

Irrigation facilities will also increase the supporting capacity of livestock by solving the problem of fodder scarcity. Better management of pastures and maintaining a balance between fodder availability and number of animals will also better the quality of livestock and return per animal. Improvement of means of transport, particularly roads, and availability of power will encourage industrial development in the region. There is good promise in the region for industries based on agro-and livestock raw materials, the former in the central places of Bagar tract and the latter in the arid part. At present, substantial quantities of oilseeds and some other major and minor food grains are not processed, and the "future develop-

AQUIFER ZONE, WESTERN RAJASTHAN

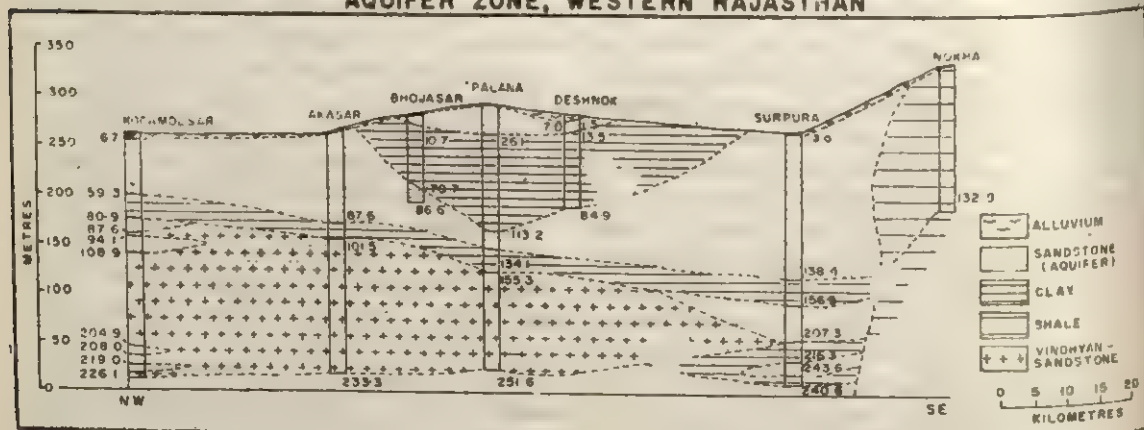


Fig. 2.15

PLATE II



A View of Jodhpur Fort



Umaid Palace, Jodhpur



Aboriginals of Dungarpur (Rajasthan)

Jaisalmer Sheep, Rajasthan



ment in agro-based small scale industries can be possible both by conversion of house-hold and non-household traditional units to modern small scale industries and through the increased availability of agricultural produce resulting from the Plan efforts".⁸³ The Techno-economic Survey of the State indicates good prospects for the development of chemical and allied industries at Bikaner and Hanumangarh, metal-based industries at Suratgarh and Jodhpur, and textile industries in Ganganagar, apart from the possibility of livestock and agro-based industries by the establishment of such processing units as pop corn and dairy products and cattle feeds. Brick making industry could be an important source of rural employment and a boost for the rural housing programme.

It is quite probable that with the nuclear power complex (Nuplex) developed in Rajasthan (Rana-pratap Sagar) and oil and gas pipe lines from Gujarat oil fields the position of power supply could be improved. Assured and adequate power supply may lure the businessmen, particularly the Marwaris, to establish industries in their homeland. It is quite probable that with the developing trend, as is reflected from developments at Pilani, Jodhpur, Bikaner and Ganganagar, etc., Rajasthan plain could exhibit a higher rate of development. In fact, Suratgarh and Pilani provide glaring examples of what can be achieved through application of capital, enterprise and modern technology in such rather inhospitable regions.

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Situated in the north-west, the Punjab Plains ($27^{\circ} 39' \text{ N}$ — $32^{\circ} 30' \text{ N}$ and $73^{\circ} 51' \text{ E}$ — $77^{\circ} 36' \text{ E}$), constitute a significant part of the Great Plains of India. The region has an area of 95,714 km² and comprises reconstituted States of Punjab and Haryana (1966) and the Union Territory of Delhi (Fig 3.1A). On the east, throughout its greater length, it is bordered by the Yamuna, while the Siwaliks, particularly the southern

slopes of their outermost range which are included in the Ambala, Rupar, Hoshiarpur and the Gurdaspur districts, form the northern boundary. In the west, the boundary though formed in its northern section by the river Ravi and an arbitrary line dividing the Bari Doab into two sections again follows the river Sutlej in its southern section. Rajasthan not only extends to its south but its arid zone also encroaches upon

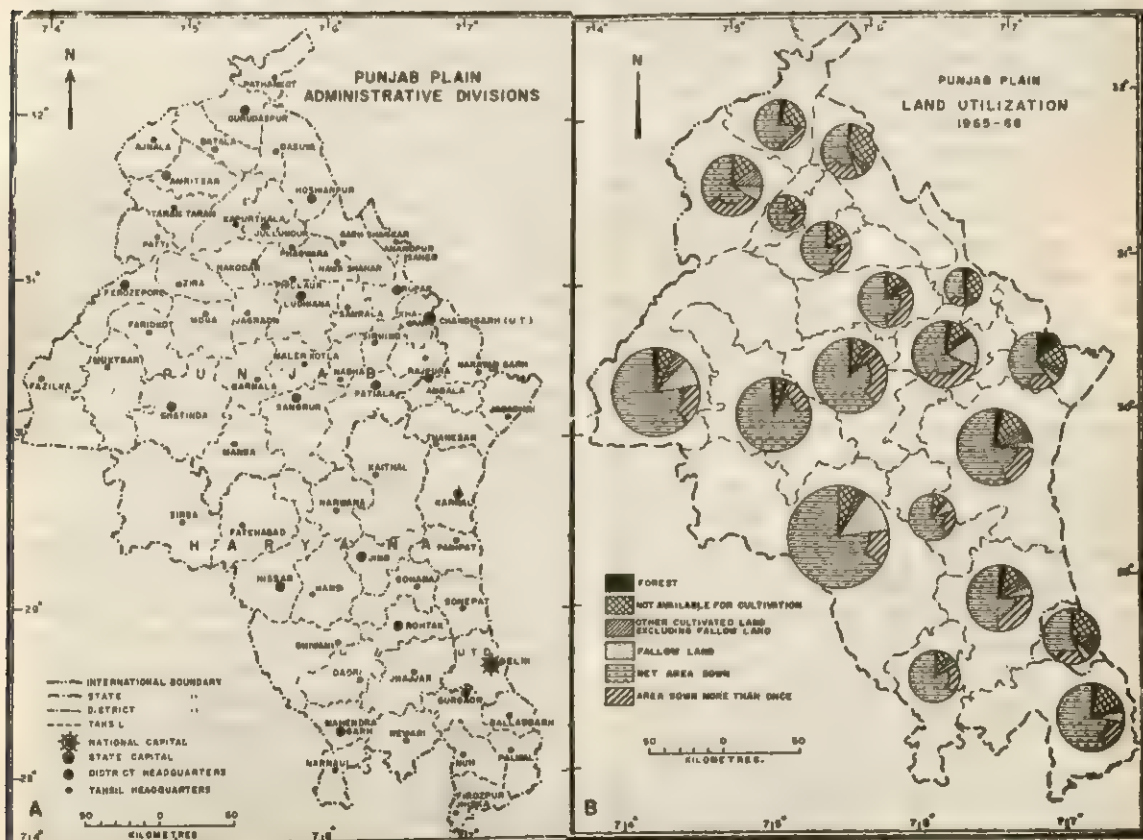


Fig. 3.1

its southern portion. The Shahdara zone of the Union Territory of Delhi (U T D)—lying to the east of the Yamuna, is a part of the Ganga-Yamuna Doab, but being administratively an integral part of Delhi, has, for convenience of treatment, been included in the Punjab Plains.

Historical Background

With the vivisection in 1947 of the pre-Partition Punjab, the geographical unity of the Punjab Plains (the western section of the Indo-Ganga Plain) has been undermined. Bari Doab, the economic and cultural heartland of the pre-Partition Punjab has been split into two by the international boundary separating India and Pakistan. This changed the whole context of geography not only of the former heartland but of the entire Punjab Plains. Both the regions became two separate entities, politically, culturally and economically.

The *Punjab Plains Region* which is physically a distinct unit made up largely of extensive alluvial deposits; culturally is a region where varied cultures have mingled and transformed after being laid in strata by wave after wave of neo-cultures emerging from the vast ocean of political and cultural upheavals. It is a region which has occupied a place of great strategic importance since time immemorial. Culturally, it is old and was settled very early in the human history. It was in conformity with the general trend of the pre-historic age when river valley cultures had evolved in the Middle East that the Indus Valley also developed a highly advanced culture which in the east extended as far as Rupa along the Sutlej in the sub-montane belt of the Plains. Excavations at Rupa have revealed the existence of a full-blooded Harappa and Painted Greyware culture at the place.¹ As Wheeler writes, "...The Indus civilization can claim...a larger area than any other of the known pre-Classical civilisations. From Rupa to Sat Kagendor is 1,000 miles (1,600 km). The axis of the two Egypts is only some 600 miles (960 km), and Lowland Mesopotamia is of a similar length.... Behind so vast a uniformity must lie an administration and economic discipline, however, exercised of an impressive kind."² Though darkness envelopes several succeeding centuries, it

appears from the geographical data furnished by the Rig Vedic hymns that the Aryans were well settled in the Punjab Plains about 1500 B. C. and Kurukshetra became the centre of their activity. The war of Mahabharata which was fought in the *Kurukshetra* about C. 900 B. C. lends further testimony to the great politico-cultural influence of the Punjab Plains over the surrounding areas. During this time the entire area was divided into small principalities or chieftainships which continued to exist right upto the Buddhist and post-Buddhist times. In 326 B. C., Alexander, the Macedonian emperor, invaded the Punjab and reached upto the Beas river but had to return without advancing further. Soon after the Plains came under the rule of Chandra Gupta Maurya. With the fall of the Mauryas there were fresh invasions from outside. "Menander is believed to have pushed his victories even beyond the river Beas."³ But it was a period of great cultural assimilation and most of "the Greek princes who had settled here succumbed to the influence of the environment and became converts to Buddhism and Vaishnavism, and by first century A. D. every vestige of them disappeared."⁴

By A. D. 318 the Gupta dynasty came into power and Indian art and culture prospered. The fall of the Guptas was followed by the invasion of the Huns who finally succeeded in establishing themselves in the (Punjab) Malwa region by A. D. 500. Towards the end of the 6th century A. D., Prabhakar Vardhan drove out the Huns and made Thanesar his capital. After the death of his glorious son, Harsha Vardhan (A. D. 647), there ensued a period of no major events till about A. D. 1000 when invasion by the Muslims started which succeeded in making great cultural inroads into the region. In A. D. 1014 Mahmud of Ghazni took Thanesar and the Muslims implanted their influence into the soil of the Plains. However, after his death in A. D. 1030 the Rajputs once again succeeded in re-establishing themselves in Delhi and the Plain around it, but the final blow to their ascendancy came in A. D. 1192 when Shahabuddin Ghori defeated the Chauhan ruler, Prithvi Raj in the battle of Thanesar. From this time onwards came wave

after wave of power-hungry invaders from across the Sulaimans which brought about significant changes in the political and cultural setting of the Plains. The establishment of the Mughal rule in 1526 completely subdued the fate of local aspirants to power.

Towards the close of the Mughal rule, once again ensued a period of religious revivalism which brought about the ascendancy of the militant Sikh power. The beginning of the 19th century introduced a new cultural element into the life history of the Plains—the impulse of the Christian influence crept in, particularly in urban areas, after the establishment of the British rule east of the Yamuna. However, the attainment of Independence once again led to rather a reversal of the politico-cultural processes which resulted in the mass migration of people belonging to different faiths. This unfortunate event of the political history has, however, set in the process of rejuvenating the region. The creation of the separate states of Punjab and Haryana (1966) out of the truncated plains after the reorganisation of Punjab has further complicated the issues. Geographical recognition can hardly be accorded to such geonomically imbalanced political units. The region occupies a position of great strategic and political importance as it always has held by virtue of the historic routes which pass through it.

The Physical Setting

Geology

Geologically speaking, much of the Plain is of a very recent age and its surface has been built up by the silting action of its wayward streams 'during the last chapter in the geological history of the earth.' The Siwaliks bordering it in the north are composed entirely of Tertiary and principally of Upper Tertiary sedimentary river deposits or alluvial detritus derived from the sub-aerial wastes of the mountains swept down by the rivers and streams and deposited at their foot. "These have been involved in the latest Himalayan systems of upheaval by which they have been folded and elevated into their outermost foothills. The folding of Siwalik sediments has imparted to them high dips and some degree

of induration both of which are of course absent from the recent alluvial deposits of the plain."⁵ The composition as well as the character of the Siwalik strata everywhere bears evidence of their very rapid deposition by the rejuvenated Himalayan rivers which entered on a renewed phase of activity consequent upon the uplift of the mountains. They are mainly the water-worn debris of the granite core of the Himalaya.

In contrast to these newly formed hills of the north and north-east, there are in the south the outliers of the Aravallis (Delhi System), belonging probably to the lower Cuddapah (Algonkian) age. In its intense structural disturbance and degree of folding it departs from the general tectonic features of that system. Local orogenic bending seems to have caused much disturbance. There has also occurred intrusions of large bodies of granite and amphibolite. "This Delhi system extends in eastern Rajasthan from Delhi to Idar in constricted, sorely eroded bands in the centre of the Aravalli synclinalorium." Within the region, their small hills and ridges consist of slates and (Alwar) quartzites. The slate is usually a fissile clay slate and is quarried near Rewari. There are brine wells in the Sultanpur mahal and sulphur springs at Sohna.

Relief and Drainage

It is quite evident (Fig. 3.2) that in the north there is a slope from the Siwaliks towards the south and south-west, while in the southeast the Aravalli outliers provide a slope towards the north. It is only in eastern Gurgaon that the land in general has a southerly and south-easterly slope. North of Delhi, practically throughout, the old high bank of the Yamuna forms the summit level of the plain. In the southern part of the Plains a band of minimum elevation runs roughly east-west where the alluvial detritus from the Aravallis meets that of the Himalaya. This band is slightly above 213 m in Rohtak district and eastern Hissar, but falls both in the east and the west where it is very clearly marked by 213 m contour. In fact these topographical differences in the north and south here have resulted in the formation of a depression near the eastern margin of Rohtak district in between the Delhi ridge and

the gently rising land to the sandy ridge of detached hillocks on which the old town of Rohtak itself is perched.

Although over the greater part of the Plains the general relief is not marked by high prominences, yet the topography may be defined as slightly undulating. The existing or the former courses of the streams provide somewhat lower areas which are interspersed by the interfluvial regions of slightly higher elevations which are termed locally as *Bangar*, *Dhaia* or *Nardak*. At places sand dunes and sand ridges occur in these interfluvial zones.

From 213 m contour the land rises almost imperceptibly towards the northeast over the greater part of the Punjab Plains to the Siwalik foothills, forming only a narrow belt in the north. Though these hills are a part of the northern mountain zone, yet upto a height of about 365 m the plains extend without any perceptible change in slope. The northern part of Ambala includes the Morni tract which contains some of the lower hills in the south but towards the north it is made up of two ridges of much higher hills running from northwest to southeast with many spurs branching out in different directions. The highest point in the tract is Karoh peak (about 1500 m) on the Nahan border. The southern slopes of the Siwaliks have been indented by a large number of hill torrents that flow down the submontane belt. In Hoshiarpur the rise above 305 m is rather steep but the crest line is hardly 600 or 610 m high. Beyond the Beas in Gurdaspur district there is a continuation of the same character but the Siwaliks shift towards the north and occupy an insignificant part (about 325 km²) of the district. As noted above, the interfluvial zones are characterised by higher ground in the middle and floodplains on either bank of the principal streams. Thus, the Upper Bari Doab upland plain comprising about 85% of the Doab area ranges in elevation from about 300 m in the northeast to about 210 m in the southwest⁶ and is flanked by comparatively lower floodplains of the bounding streams, the Ravi in the west and the Beas in the east. The Bist-Jullundur Doab, likewise, is a higher triangular upland plain flanked

by the broad floodplains (*Bets*) of the Beas and the Sutlej.

In the extreme south of the plains the continuations of the Aravalli hills extend towards the north and northeast as low detached ranges with gaps which contain a few depressions at places. These gaps have a roughly NNE-SSW alignment and apart from having better water facilities, have provided easy routes between Delhi-Haryana region and Rajasthan.

Topographically this region is characterised by a reversal of slope and presents a considerable variety of relief. The Aravallis in the course of their long geological history have been intensely eroded and now appear as four widely separated rows of detached hills or ranges. The westernmost of these is the highest but more discontinuous. The highest point (652 m) lies to the west of Narnaul town. The other arm of the Aravallis forms a continuous range terminating in Delhi. In between, there are only low hills to the west of Bawal and Rewari towns. In the extreme east there is another narrow range which though a little higher and continuous in the south becomes more and more broken in its northern portion where it is practically buried in the alluvium of eastern Gurgaon plain.

In between these higher prominences there are gaps and depressions which from east to west are :—(1) Ferozepur Jhirka—Nuh gap, (2) Sohna depression (3) Sahibi gap and (4) Narnaul or Krishnawati—Dohan gap. All these gaps seem to converge at Delhi and have provided entry routes to the central and western India. They had been utilised by roads before the railway era and now the railways have penetrated the two western gaps. The central or Sahibi gap is particularly important as the town of Rewari there has become an important railway junction. Several other towns as Nuh, Ferozepur Jhirka and Narnaul have grown along these routes.

North of the Aravalli extensions the whole tract is traversed by a number of sand ridges which mostly run from north to south and form higher prominences in the physical landscape. Into the depression of Najafgarh lying in the UTD occasionally flow some of the streams from the southern hills,

Much of the southern part of Hissar district is sandy and characterised by shifting sand hills interrupted in places by firmer and in parts loamy bottoms. This is the *bagar* tract and the depth of water level is well over 30 m and the water is frequently brackish.

The Khadar of the Yamuna lies between the present water course and the old high bank of the river. The old high bank runs parallel to the river throughout its greater length in the Punjab Plains. It is narrow in Ambala district but broadens out to about 16 km in Karnal and Rohtak districts. Though not very well-marked in the south of the U T D, it broadens out somewhat in Gurgaon but narrows down rather quickly in the south.

The Sutlej *Bet* runs throughout the left bank of the river in the region. On an average it is about 10 km wide; at places it widens to as much as 20 km while it narrows down to a few km west of Ludhiana city.

Rivers : Though the region is apparently rich in rivers, its greater part suffers from a lack of perennial rivers and a very unequitable distribution of the drainage channels—a direct result of its topography and climate. The Ravi, the Beas, the Sutlej and the Yamuna are the only perennial rivers and have their sources in the snowy regions of the Himalaya. The Ravi and the Beas both originate from near Rohtang pass in Himachal Pradesh. In the Upper Bari Doab several short streams flow down the northern heights and join the Ravi and the Beas (Fig. 3.2). The only large tributary of the Ravi is the Kiran Sakki which joins it on the left bank in the south near the international boundary with Pakistan.

The drainage of the Bist—Jullundur Doab is in great contrast with that of the Bari Doab. Numerous torrents or *chos* take their rise from the Katar Dhar and Sola Singhi (sixteen-horn ridge). The banks of these *chos* are low and undefined and during the rains their waters and the debris of sand and gravel are spread over the gently sloping plains. On the steeper slopes, by virtue of greater velocity, the *chos* are able to cut deep incisions but the moment they come to gentler slopes they split into undefined channels.

Out of the 93 *chos* flowing to the south-west in the Hoshiarpur district the majority join the White Bein and the Black Bein, both joining the Sutlej at the south-western extremity of the Doab within about 11 km of each other.⁷ The *chos* of the middle section in the neighbourhood of Hoshiarpur town have longer courses than those near the southern and northern extremities of the Doab. Even so, the *cho belt* does not exceed 32 km in width. Owing to their incapacity to carry forward the excessive load, they deposit large amounts of sands, gravels and boulders, and have thus rendered vast lands infertile. Southeast of the Sutlej none of the streams except the Yamuna is perennial. The only river of importance traversing the middle of this extensive part of the Plains is the Ghaggar, which, though perennial in its upper course, becomes dry after flowing for a short distance from the hills. In fact this entire Plain forms a major region of rather inland drainage. The Yamuna which flows almost due south fails to receive the streams coming down the Siwaliks with the exception of the Somb Nadi and its tributary, the Boli in the extreme east of the hills. All other streams which flow in a south-westerly direction have broad sandy courses scarcely below the surface of the country. They vary in breadth from less than 92 m to upwards of 1600 m. They are dry during the greater part of the year but become a formidable body of water in rainy season. This character they maintain for some 32 km below the hills as in the Bist Doab after which they gradually tame down into sluggish streams with well-defined clay banks and a volume much diminished by absorption in the sands. Ultimately almost all unite in the Ghaggar which from the commencement is the most important and which alone pierces the Siwaliks between the Sutlej and the Yamuna. The Ghaggar contains a lot more water during the rainy season and at that time it normally flows upto Hanumangarh in Bikaner, a distance of about 465 km from the source. Beyond, its course is represented by the dry bed of the Hakra.

The hill torrents in the past used to bring down and deposit fertilising silt, but owing to the progressive denudation of the Siwalik hills,

they are now nothing more than an unmitigated pest in the Ambala district. They unload large quantities of sand and gravel over the countryside and spread destruction far and wide.

There is evidence of the shifting of river courses within this region. There are abandoned channels in Ferozepur as well as Hissar districts. The dry bed of the Naival is definitely an abandoned channel of a river which exists no more. War Nadi, another dry bed is probably an abandoned channel of the Ghaggar. The Sutlej and the Yamuna both have shifted considerably from their former courses.

The streams flowing towards the north in Gurgooan district from the Aravalis are short with highly fluctuating regime; notable among these from west to east are the Dohan, the Kasauti, the Sahibi and the Indori.

Ground Water

In general the water table in the Plains (Fig 3.3) rises from the south towards the north and the east with the exception of the Ghaggar valley. Over the greater part of Hissar, south-eastern Ferozepur and Jind districts the sub-soil water is very deep-seated. It is generally more than 10 m deep except in the bed of the Ghaggar and in the depression near Hansi. The greatest depths are as much as 50 m. In the north-eastern part in Rohtak, Karnal and Ambala districts the sub-soil water depth ranges upto 9 m though over considerable areas it is not more than 3 m. Between the Sirhind canal and the Yamuna, water depths range from 3m to 9 m.⁸ Small tracts in (i) Barnala and Malerkotla tahsils, (ii) along the right bank of the Sutlej in Bist Jullundur Doab and also along the right bank of the Beas in Upper Bar Doab and (iii) in the foothills of Hoshiarpur and Gurdaspur districts have water table between 3 m to 9 m.⁸

There are, however, two belts—(i) close to the left bank of the Sutlej in Ferozepore and Ludhiana districts and (ii) in much of the Upper Bari Doab where the water table ranges between less than 1 m to 3 m. Widespread water logging conditions occur within these belts mainly due to canal irrigation and faulty alignment of many of the roads.

Climate

The Punjab Plains enjoy a semi-arid monsoon type of climate; owing to a long distance from the seas the region fails to get the full benefit from monsoon currents. It is characterized by a deficiency of rainfall over its greater part, high summer temperatures and evaporation, more especially in the southern parts, exhibiting as a whole a transition between the arid deserts of Rajasthan and the moderately humid Upper Ganga Plain. It experiences the usual three seasons—the winter, the summer and the rainy. Both the heat in summer and the cold in winter are extreme. Moreover, there are not only considerable differences in the weather from season to season, but also from year to year. These changing weather conditions, though have repercussions on its agriculture, have produced a hardy people of good physique.

Temperature : The annual average temperature ranges from 23.1°C (Amritsar) to 25.1°C (New Delhi), showing an almost uniform condition in the region, although there is considerable seasonal range (Amritsar Jan. mean 11.8°C; New Delhi June mean 34.5°C). Over the entire region the highest average temperatures are obtained in June, ranging from 32.9°C (Chandigarh and Amritsar) to 34.5° (New Delhi). The temperature curves (Fig. 3.4) are almost symmetrical with single peak and show wide seasonal variations.

By the end of October the cold weather sets in and the temperatures are markedly lower than the summer ones. The mean monthly temperatures during November to February are below 20°C and January is the coldest month throughout the region varying from 11.8 to 14.2°C in different parts. As a result of cold waves the minimum temperature occasionally falls below freezing (Hissar, -3.9°C, Jan. 31, 1929) causing heavy damage to crops. By March the temperature rises rapidly (over 5°C) though still the nights remain cool. The rapid rise continues upto May, showing an increase of over 10°C since March. The rise is slow from May to June (often below 2°C). With the onset of monsoon the temperatures gradually decrease up to September after which the fall is rapid. The normal

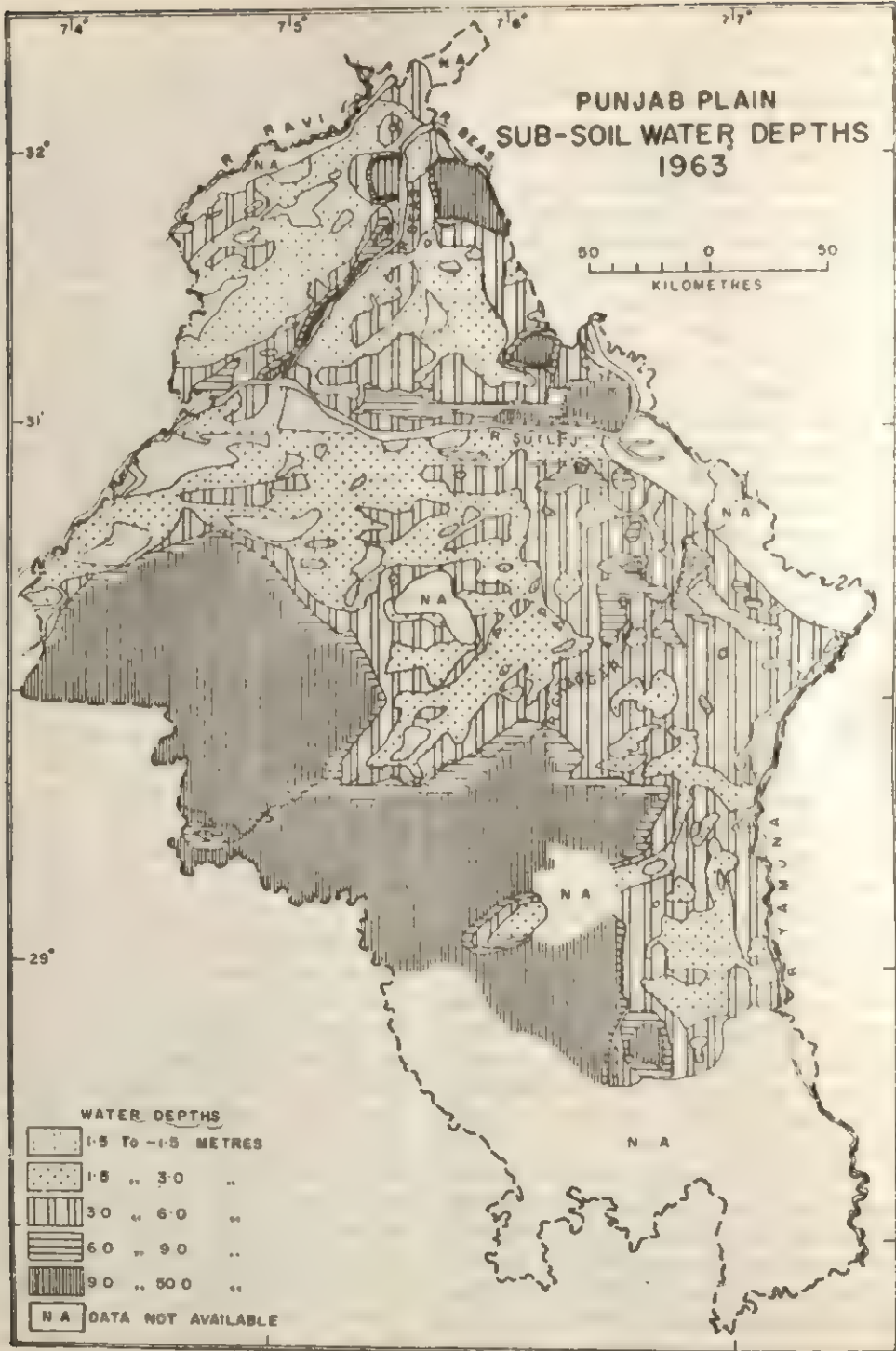


Fig. 3.3

maximum monthly temperature exceeds 40°C for June and 39°C for May at many stations (Table 1).

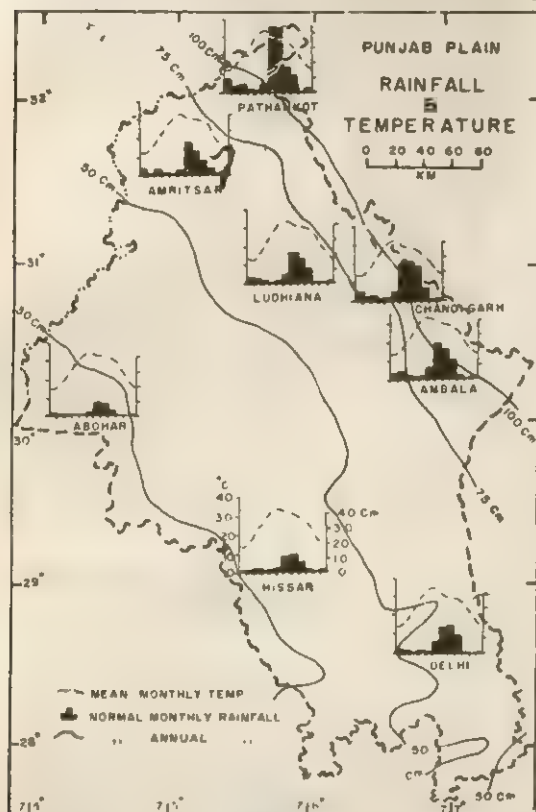


Fig. 3.4

TABLE 1

Normal Monthly Maximum Temperature ($^{\circ}\text{C}$)

	May	June	Annual
New Delhi	41.2	40.2	31.8
Hissar	40.7	40.9	32.2
Ludhiana	40.1	40.4	31.2
Amritsar	39.4	40.5	30.5
Pathankot	39.0	40.2	29.8

Although temperature conditions are more or less uniform, yet it is not so with rainfall, which, in general, decreases from north-east to south-west (Fig. 3.4). The sub-montane tract receives, on an average, above 75 cm of rainfall annually, while in the extreme southwest it decreases to less than 30 cm. In the south-east there is a slight increase in rainfall in the Aravalli hills tract.

Most of the rainfall occurs during the monsoon season from July to September, after which the rains almost cease and October remains rather dry, but the driest month is November. The rainfall even during the monsoon season is intermittent with intervals of clear weather and fairly high relative humidity. In years of deficient rainfall these intervals are prolonged and cause failure of crops, particularly in areas of poor irrigation facilities. Sometimes a cyclonic storm from the Bay of Bengal moves westward across North India and turns in a northerly direction towards the Punjab-Kumaon hills. It causes very heavy rain and sometimes even in a single day, the fall exceeds 25 cm. "As the natural drainage of the region has been very much disrupted by its long occupation of man" very often they lead to floods Fig 3.2A and large scale damage to crops and settlements, more specially in the *Bet* and *Khadar* lands. Some of the towns, situated in shallow depressions because of availability of sub-soil water in them, suffer most from these floods. Patiala, so located, suffered a lot till it was made secure by building embankments.

The region often receives rains during the winters from the Western disturbances followed by cold spells. These rains are highly beneficial to the *rabi* crops; in fact, this region gets the maximum winter rain in the country due to the Western disturbances. January is, however, the rainiest winter month.

Strong wind and dust-storms : From April to June practically throughout the day hot winds blow steadily from the west. They are desiccating and scorching and die out at the outbreak of the monsoon. Another unpleasant feature of the climate is the duststorms which are quite common before the outbreak of the monsoon, more specially in the southern parts. They sometimes bring light showers.

The climographs for Hissar, Ambala and Ludhiana provide a picture of human comforts under natural climatic conditions. In general, mornings are much better than other parts of the day, except the winters, when temperatures about the mid-day are more congenial than those of early mornings (Fig. 3.5 A). On the whole the morn-

ing condition of relative humidity and wet bulb temperature is ideal or very rarely uncomfortable from about the middle of April, while June to September are mostly uncomfortable. The weather in July and August approaches the muggy condition.

The afternoons are comfortable in December, January and February and nearly so in March and November; the rest of the year is mostly uncomfortable (Fig. 3.5 B). The high wet bulb temperatures are associated with low relative humidity up to June, whereafter July, August and

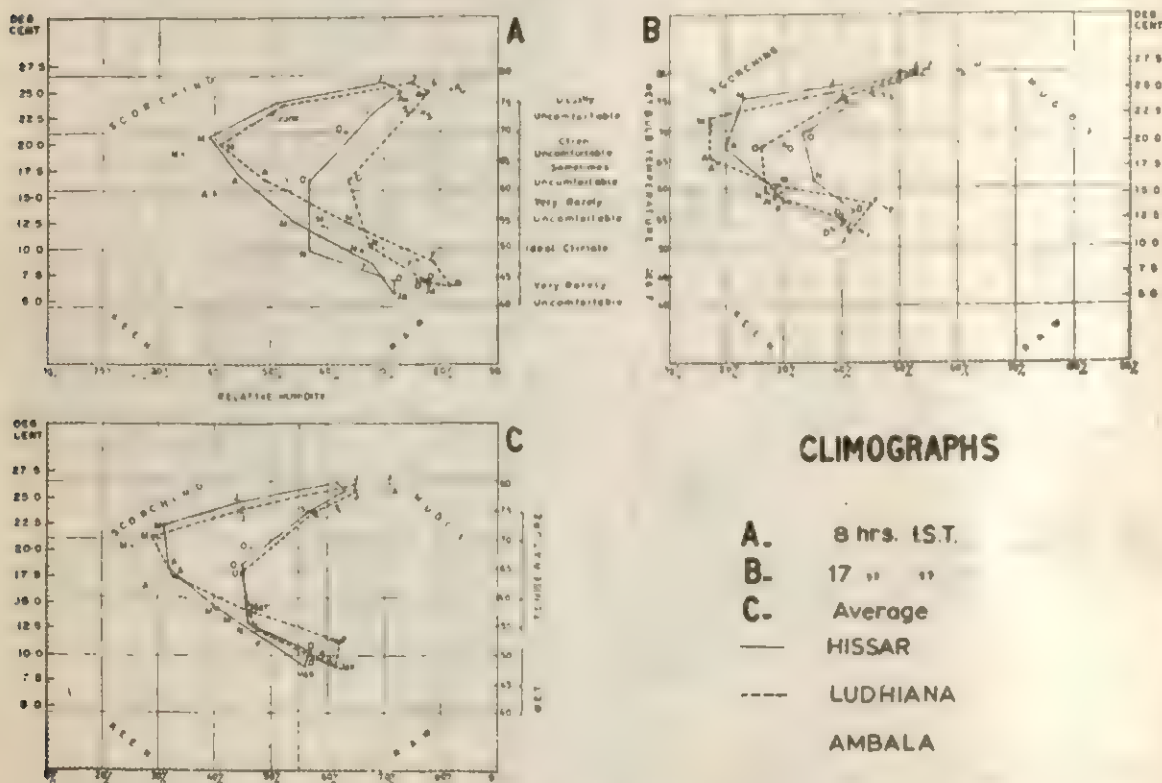


Fig. 3.5

September become more humid, especially in the sub-montane belt (Ambala). These climographs indicate arid conditions excepting in the case of Ambala, where July and August are moist.

The mean conditions (Fig. 3.5 C) show that November to March have fine and comfortable climate. May and June have scorching conditions, while July, August and September are muggy. The months from July to September and December to February are moist while the rest are rather arid.

Soils

The soils of the region are alluvial in character. In the southern part in the *Bagar* tract the characteristic feature is a light sandy soil and shifting sand-hills interrupted in places with firmer and in parts, loamy bottoms. In Sirsa tahsil, to the west of the *Bagar* is a plain of very reddish loam known as the *Robi*. These lands are generally unproductive. The sandy soils are deficient in nitrogen, phosphorus and potassium. To the north and east of these sandy tracts, the soils are largely calcareous and usually have a massive

Kankar layer at depths of 0.75 to 1.25 m. They are also deficient in nitrogen, phosphorus and potash.

In the *Nali* tracts of Karnal formed by the overflow of the Ghaggar streams the land on either banks has been transformed into hard clay which yields little to the peasant without heavy floods.

In the Doabs and over the rest of the region the essential difference in soils lies between the younger or newer alluvium of the flood plains and the older alluvium beyond the high banks. The younger soil tends to be clayey while the older alluviums are at places overlain by layers of sand where the winds are active as agents of transportation and deposition. In the *Sutlej Bet, reh* or *Kallar* forms due to the impregnation of the saline and alkaline compounds in the upper layers of the land.

Natural Vegetation

With only 3.4 percent of the area under forests of all categories (1966-67), the Punjab Plains are one of the least forested. Its prevailing aridity and long human occupance have been responsible for its poor vegetal cover. No doubt, in the remote past there were extensive areas covered with natural vegetation, particularly in the southeast (Haryana) and the sub-montane belt right from the bank of the Yamuna to the Ravi, much of which has been removed. The existing forests are mainly confined to the narrow sub-montane belt where the Ambala, Rupar, Hoshiarpur and Gurdaspur districts have together over 68 percent of the total forest cover. Over the greater part of the Plains, the natural vegetation is either the tropical thorn forest—within the more arid south and southwest, or tropical dry deciduous forest over regions having more than 40 cm of annual rainfall. The thorn forests reappear in a narrow belt at the foot of the Siwaliks in Hoshiarpur and Rupar districts. Gurdaspur has sub-tropical arboreal vegetation. The dry thorn forests have short, stunted thorny bushes with occasional *Kikar* or *Babul* trees. The scrub jungles consist mostly of *Jal*, *Jund* and coral flowered *Coper*. Tropical dry deciduous

forests have a predominance of *Kikar* in southern and southwestern margins with *Shisham* in the northern parts of the Plains and in the foothills along the Siwaliks, and *dhak* jungles in Karnal and adjacent parts of Patiala district. For the most part the hilly tract of the south is without much vegetation. A few stunted trees and shrubs grow on the hills and in the rainy season grass springs up.

Minerals

The 'Plains' proper do not contain minerals except *Kankar* deposits along the high banks of the rivers. The hilly regions, more especially the Aravalli tract of the south possess small deposits of iron ore of an average iron content of 57 percent. They are found in Dhanauta—Dhancholi area (reserves 600,000 tons) and near Narnaul (reserves 3,400,000 tons). Its production, however, is not much. The production was 12,259 tons in 1960 and it declined to only 3,091 tons in 1963.

Limestone of good quality occurs in Ambala and Mahendragarh districts. Bhupendra Cement Factory at Surajpur uses the nearby deposits, which, however, may not last for more than a decade. But the area has several other deposits with estimated reserves of 26 million tons. The erstwhile Punjab State in 1965 produced 5,37,622 tons of limestone. The other mineral worthy of note is slate which occurs in Gurgaon and Mahendragarh districts. These slates by virtue of their desirable flat cleavage are used for various purposes. In 1964 the erstwhile Punjab State produced 10,651 tons of slate.

The Cultural Setting

Population and Settlements

Though Nature has not been benevolent in endowing the region with adequate natural resources, yet it has gifted the land with one of the finest stock of peoples. The dry climate with extremes of temperatures, and the region's cultural history have 'forged a hardy stock that knows how to wrest a living from nature'. It is this characteristic of the people of the Punjab Plains that has made the meagre resources of the region

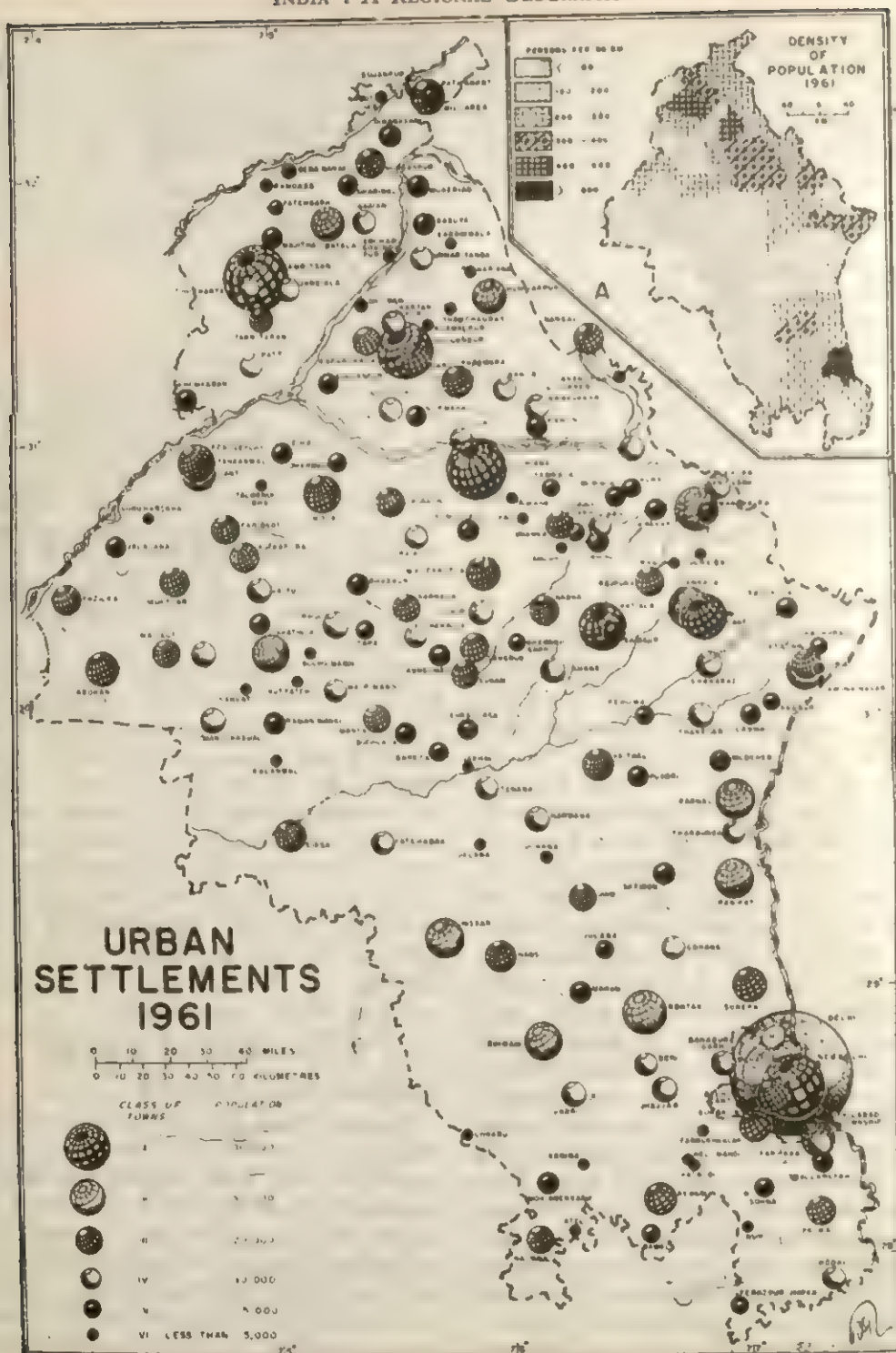


Fig. 3.6

look great. Still with a population of nearly 21.4 million (1961), the Plains are not densely peopled. The overall density of population is only 224 per km² (1961). Half a century back in 1911 the density was extremely low, only 118, which increased to 164 in 1941 and 173 by 1951. In other words, in 1961, there were 106 persons more to the km² than in the year 1911. Within these fifty years the population has increased by 90 percent. Due to variations in the physical and cultural environment, the population is not uniformly distributed. The highest density of 1854 persons per km² is found in the UTD due largely to its large scale urbanisation (Fig. 3.6A). Outside the UTD, Jullundur district has the highest density of 353, followed by Amritsar (302). In fact, most districts within Upper Bari Doab, Bist-Jullundur Doab and the submontane belt of Ambala have a comparatively higher density than the southwestern plain. Except Kapurthala (206), no other district has a density of less than (220). The eastern districts along the Yamuna show marked variations in their density. Whereas Rohtak (235) and Ambala (231) have densities above the regional average, Gurgaon (204) and Karnal (187), both have much lower densities. The low density of Karnal, which lies between Rohtak and Ambala districts, is because of its bad drainage and unhealthy climate. In the north of the district much of Thanesar and northern part of Kaithal tahsils are intersected by mountain torrents and even today include large tracts of wild country covered with forests of *dhak*. Other parts too, were not highly settled till quite a late period. The *Nardak* was a favourite hunting ground of the Mughal emperors and as late as 1827, Archer says that lions were sometimes seen within 32 km of Karnal while tigers were exceedingly common.⁹ Bad drainage is to a great extent responsible for unhealthy conditions in the *Nali* or *Naili* tract of the Saraswati. Recently, however, forest areas have been cleared and drainage improved and it will have good effect on the population density. The new township of Nilokheri has been built on a land which was a forest-covered swampy tract of the district before Partition. In the case

of Gurgaon, its varied relief, irrigation facilities and the hardy *Abirs* in its drier section, have all been responsible for the higher density. The climate is healthy and both heat and cold are less extreme than in the more northern parts.

The density decreases from these areas towards the west and southwest. Thus, Sangrur (187), Jind (164), Ferozepore (161), Mahendragarh (158), Bhatinda (153) and Hissar (111) have some of the lowest densities. Much of this southwestern section is in fact a transitional zone between the Marusthali and the Plains, and formerly lacked adequate water facilities.

Even areas with adequate water facilities, as for example, the floodplains of the Upper Bari Doab have lesser densities (40 to 160) because of very high water table than upland plains (230 to 400)¹⁰.

Growth of Population : From about 12.4 million in 1901 the population of the region rose to 21.4 by 1961, giving a percentage increase of 72.7. During this period the dry zone districts of the southwest have registered a greater percentage increase than most districts in the north, particularly those lying in the Upper Bari Doab and the Bist-Jullundur Doab. Maximum increase has of course been in the U. T. D. which registered a rise of over 555 percent. Outside this territory the largest increase of over 97 percent took place in Hissar district, followed by Ferozepore (74.8), Rohtak (65.5), Karnal (71.2) and Ludhiana (56.8). The Doab districts—Hoshiarpur (25.5%), Jullundur (33.6%), Kapurthala (16.5%), Amritsar (29.3%) and Gurdaspur (40.0%), all recorded a much lower increase. This is largely due to the fact that the Doab districts have almost reached the carrying capacity of the land at the present level of agricultural development, whereas the south-western parts still have further scope for growth. Provision of increased irrigation with the commissioning of Bhakra-Nangal Project and other irrigation works has increased the carrying capacity and hence the rise in population there is greater. In these areas the population has increased more rapidly after Partition as would be clear from the following table :

TABLE 2

District	Percentage increase during 1951-61	Highest Decennial percentage increase before 1951	
		Increase	Decade
Hissar	47.3	11.9	1931-41
Ferozepore	27.0	23.0	1931-41
Ludhiana	26.6	22.0	1931-41
Rohtak	26.6	18.4	1931-41
Karnal	38.3	16.7	1931-41
Hoshiarpur	12.7	13.5	1931-41
Jullundur	16.3	19.4	1931-41
Kapurthala	16.5	19.5	1931-41
Gurdaspur	16.1	19.1	1931-41
Amritsar	12.3	25.2	1931-41

The Doab districts had registered higher percentage increase during 1931-41 than during 1951-61. Partition caused a considerable loss to their population.

Partition and Population Change : Partition was instrumental in changing the distribution and trend of population. It also completely altered the composition of population by religion. Table 3 shows the displaced population (1951), both rural and urban on the one hand and the 1941 Muslim population along with its residue in 1951 on the other.

It will be seen that with the exception of the U. T.D., the number of displaced persons in the

TABLE 3

Numerical strength and Percentage of Displaced persons settled in Urban and Rural areas (1951), and Changes in Muslim Population, 1941-1951.

District*	Total number of displaced persons	% Settled in		Muslim@ in 1941	Population in 1951
		Rural areas	Urban areas		
Hissar	127,657	61	39	285,208	3,312
Rohtak	123,646	43	57	166,569	2,562
Gurgao	84,587	33	67	285,992	163,663
Karnal	250,471	53	47	304,346	3,658
Ambala	188,892	46	54	268,999	23,106
Ludhiana	169,267	46	54	302,482	3,360
Ferozepore	358,341	81	19	641,448	4,875
Patiala	119,518	43	57		2,893
Barnala	22,414	66	34		41,673
Bhatinda	48,382	50	50	653,097°	416
Fatehgarh-Sahib	35,040	68	32		2,269
Sangrur	36,834	50	50		3,741
Mohindergarh	4,944	11	89		1,450
Hoshiarpur	146,935	75	25	380,759	1,353
Jullundur	273,625	52	48	509,804	2,569
Kapurthala	84,696	74	26	213,754	854
Amritsar	332,260	57	43	657,695	4,237
Gurdaspur	297,581	72	28	589,923	9,370
Delhi	495,391	5	95	304,971	99,501
Total	3,200,481			5,565,047	374,862

* These administrative divisions are as they were at the time of the 1951 Census.

@Muslim population for 1941 is from the Census of India, 1941.

° Total Muslim population of former princely states of Malerkotla, Faridkot, Patiala, Jind and Nabha. Since these territories were not contiguous and districts formed out of them comprise territories belonging to more than one state, the Muslim population has been taken as a whole. Even so there is every likelihood of slight error in the totals taken due to some overlapping.

PLATE III



A Desert Village in Rajasthan



A Desert Village As a Central Place

University campus, Chandigarh



Delhi



Plains falls short of the Muslim population that moved out of these districts. Thus, whereas out of an approximately 5.5 million Muslim population of 1941, there remained only about 3,74,862 Muslims in the Plains, the displaced persons that actually settled there upto 1951, were hardly 3.2 million. A large number of displaced persons could not be absorbed in this area and people had to move to other parts of India. There are only two districts, Gurgaon and Barnala from where substantial numbers of Muslims did not migrate to Pakistan and hence there has not been any marked change in population composition (by religion) there. In the rest of the region, except Delhi, the Muslim population is negligible. The balance of the in-migrants and out-migrants was not so favourable as to contribute towards the maintenance of the natural trend of growth of population as prevailed before the Partition. Moreover, this being a border region, the in-migrants were too apprehensive to undertake the risk of settling down in this region.

Urbanisation : The region has 29.2 percent of its population in urban settlements of varying sizes ranging from less than 5,000 persons to over 100,000 or more. This percentage comes down to 20.7 if we exclude the UTD, which by virtue of its predominantly urban character (88.7 percent) dominates the regional urban scene. Because of better climate and soil and more industries the northern districts are more urbanised than the southern dry zone districts. Ambala (34%) and Amritsar (30.2%) form the two ends of a zone with moderately urbanised districts in between : Ludhiana (29.2), Jullundur (28.5), Patiala (26.1), each with more than one-fourth of its population in urban areas, and all having rather considerably more than the Indian average (18%). Kapurthala also, with 23.1 percent has a higher percentage of urban population than the average for the 'Plains' outside UTD. But from this extensive belt the urban population decreases both to the north and to the south. Gurdaspur (19.5%) is much less urbanised than Amritsar, though it also lies within the Upper Bari Doab. Hoshiarpur (10.8%) being cho-infested, is the least urbanised district of the northern section.

The two districts of Malwa Plain, Ferozepore (20.1) and Bhatinda (21.2) have near average urban population. Much of Haryana is still largely rural and in no district, except Ambala, the urban population attains even the average for the Plains. Next to Ambala is Karnal (17%), followed by Gurgaon (16.6), Hissar (15.6), Rohtak (13.2), Jind (12.2) and Mahendragarh (9.7).

This urban population pattern of the region is, however, the result of a growing tendency towards urbanisation of population almost from the beginning of the century.¹¹ It is interesting to note that whereas the total population rose by nearly 90 percent between 1911-1961, the urban population rose by more than 325 percent in the same period. Changes in the economic and political setup of the region have been the primary factor in bringing about greater urbanisation than before. It may further be noted that the rate of population growth has not been uniform in all the towns. Between 1901-61 the population of the towns of Ludhiana, Jullundur, Patiala, Amritsar and Ambala Cantt. rose by 506%, 308.7%, 133.8%, 133.6% and 109.2% respectively. An example of how changed circumstances bring about rapid growth of a town is provided by Rohtak. The town had the 15th place in 1901 with a population of 20,323 in the region (excluding Delhi), by 1951, it gained 6th place and recorded an increase of about 254% and 334% by 1961, while the town of Bhiwani (35,917) which was the 6th town in 1901 went down to 11th place by 1951 and it has gained only 62% in population upto 1961. There are quite a large number of urban settlements which though did not lose their class of 1901, they showed a considerable decline in population during 1901-51. Narnaul, Bassi, Sanaur, Jhajjar, Mahendragarh, Sultanpur, Sadhaura, Nurmahal, Rahon, Garhshankar, Bawal, Sohna, Pataudi, Sri Gobindpur, Gardhiwala, Khanpur, all suffered a decline in their population. Many other towns like Urmar Tanda, Farrukhnagar, Ferozepur, Jhirka, Chhachhrauli, Buriya, Hariana, Miani, Anandpur Saheb, Dera Baba Nanak, Banur and Hadiya went down below their 1901 class in 1951 (Fig. 3.7).

It is quite strange that in a town which has experienced continuous growth between 1901-1951, such as Jullundur, Rohtak, Muktesar, Pathankot, Guwaspur, Mahabubnagar, Bhainsi, Shahabad, Jind and Zira. In some cases political changes

secured the status of towns for the first time between 1941-51. Two entirely new townships of Faridabad and Noida grew up to help solve the problem of the displaced persons. Of these settlements quite a large number have grown along the Delhi-Ferozepore railway line. Such are the towns of Jullana, Uchana, Lakhal Mandi, Mandi Kot-Fatch, Goniana which have all grown between 1941-51. With few exceptions no new town has come into existence in the greater part of Hissar. Partition has further been instrumental in bringing about vast areal expansion of a number of old existing towns and cities owing to a variety of factors, some associated with the rehabilitation of displaced persons while others arising from changing social, economic and political conditions. More education, better transport facilities (especially roads), increase in trade and commerce, growth and expansion of industrial activity and the overall resultant higher standard of living and the like have all considerably helped the urban growth.

The post-independence areal expansion of the pre-existing urban habitat has been especially rapid in the fringe areas of large number of towns leading to the development of residential, industrial, civil station and commercial suburbs.

The Ranga tract along the old ghats of the Yamuna witnessed maximum development in the regard where several of the new townships were built alongside Panwar, Faridabad, Sonapat, Paspat, Karnal, Yamunanagar and the new township of Noida.¹⁰ New residential colonies were also built alongside Rohtak, Guwaspur, Rohtak, Ambala, Rapsara, Ferozpur, Hissar and Ludhiana. At many of these centres industrial estates were also developed.

A feature of great significance is the pattern of growth of the new townships and colonies. They have not grown haphazardly, like most of the old towns but each one is the result of a well-planned scheme and has been developed in a regular manner in a planned way. The new townships have been built on the outskirts of the old towns. Faridabad which has actually become a model of modern town planning (Fig. 3.8),



Fig. VI

have added to the urban network. These are the new townships of Faridabad, Sonapat, Paspat, Karnal, Yamunanagar and the new township of Noida.¹⁰ New residential colonies were also built alongside Rohtak, Guwaspur, Rohtak, Ambala, Rapsara, Ferozpur, Hissar and Ludhiana. At many of these centres industrial estates were also developed.

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18,617 villages. These villages vary in population size from less than 200 persons to over 10,000. In the well-drained upland areas and drier parts of the Plains, the villages are fairly large in size. Thus, as would be evident from the following table 12 out of 18 districts viz. Rohtak, Jind, Hissar, Bhatinda, Sangrur, Ferozepore, Amritsar, Karnal, Ludhiana, Jullundur, Mahendragarh and Gurgaon comprising nearly 80% of the total area of the Plains (excluding UTD) have from about 52 percent to about 85% of their rural population in medium to large sized (over 1,000 population) villages. In contrast, much of the remaining parts of the Plain lying in the heavier rainfall zone or badly drained sub-montane tracts, viz. the districts of Kapurthala, Gurdaspur, Hoshiarpur, Ambala, Rupar, and Patiala have from 57 percent to 72 percent of their rural population in smaller villages (under 1,000 population). 80 to 86 percent of the rural population of Jind and Rohtak districts resides in medium to large villages. The highest percentage of small villages is in the districts of Rupar (91%), Ambala (90.9%), Patiala (90.7%), Gurdaspur (88.8%), Hoshiarpur (88.3%) and Kapurthala (86.9%). In these districts the villages are more closely spaced than in the drier parts where the large sized villages have a higher proportion. A clearer picture emerges when we take into consideration the average number of villages in 100 km² of area in each district (Table 4). It would be evident that the intensity of rural settlements increases with the increasing amount of annual rainfall.

TABLE 4

District	Average number of villages per 100 km ² (1961)	District	Average number of villages per 100 km ² (1961)
Hissar	7.5	Gurgaon	23.8
Bhatinda	9.6	Ludhiana	25.0
Jind	11.0	Patiala	31.0
Rohtak	12.6	Kapurthala	31.5
Sangrur	13.8	Ambala	33.0
Ferozepore	14.0	Jullundur	34.0
Mahendragarh	15.7	Hoshiarpur	39.0
Karnal	17.0	Rupar	40.0
Amritsar	23.0	Gurdaspur	43.5

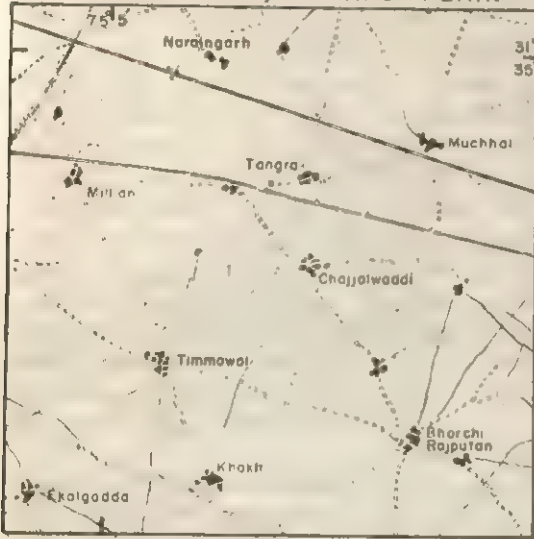
Thus, Gurdaspur having the highest rainfall has the largest number (43.5), while Hissar with the lowest rainfall has the smallest number (7.5). There are only minor deviations from this general pattern of settlement distribution. Apart from the distribution and amount of rainfall, other physical factors, such as sub-soil water, its depth and salinity, water-logging and the prevalence of sand dunes, and cultural factors like security have determined the location, distribution and size of villages, whereas the canals, railroad and roads etc. have contributed to the modification of the settlement patterns.

Throughout the canal-irrigated tracts villages are uniformly spaced, roughly 3 km apart. They are compact and are generally circular in form. The canal distributaries usually form a wheel pattern whose hub is invariably the village settlement (Fig. 3.9 D). There are on an average 10 villages within 100 km². The dry zone without irrigation has very widely spaced rural settlements. They get closer only where sub-soil water of good quality is available. In the dry rocky tract of Hissar adjacent to Bikaner desert (Fig. 3.10 B) only two large villages exist within 100 km²—the largest being Sewani. Its size is largely due to the metre-gauge railway line which enhances its nodality and commercial importance. A *mandi* (wholesale grain market) has grown near the railway line there. The other village is Khera. In eastern Haryana, the compactness of the village settlements is maintained. Rohtak has a much higher percentage of large-size villages as compared to Karnal. Considerable areas are still occupied by scrub jungles there and canal irrigation is limited. The rural settlements are wide apart (4 to 6 km) except where cultural differences have caused two settlements to grow in close proximity—as Bal Rangharan (of Rangher Rajputs) and Paban Hasanpur (Fig. 3.9 C).

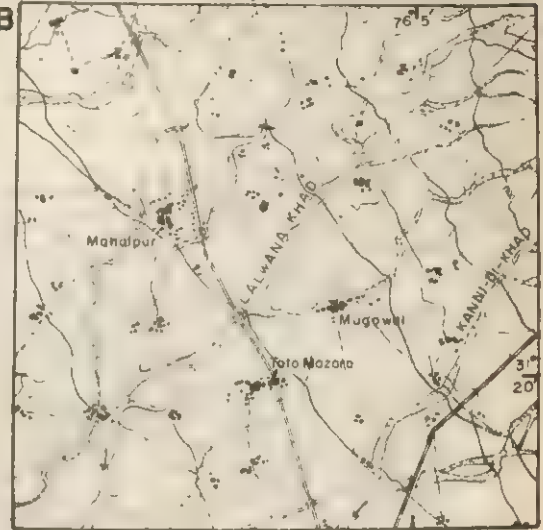
The Upper Bari Doab with its intensive utilisation of land for agricultural purposes, has developed closely-spaced (1—2 km apart) compact settlements. On an average, the number of settlements exceeds 20 in 100 km². Often settlements grow separately on community basis (as in Karnal). Thus the two settlements of Bhorchi about

RURAL SETTLEMENTS

UPPER BARI DOAB, UPLAND PLAIN

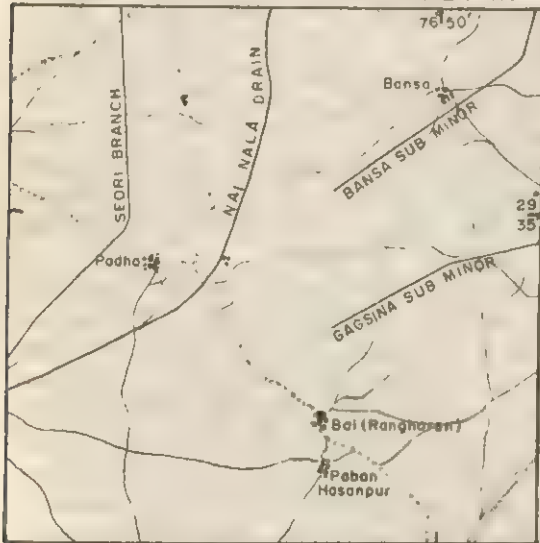


SUBMONTANE BELT, HOSHIARPUR CHOS



0 1 2 3 4
KM

BANGAR TRACT OF E. KURUKSHETRA



THE PUNJAB MALWA, ABOHAR-MUKTSAR PLAIN



Fig. 3.9

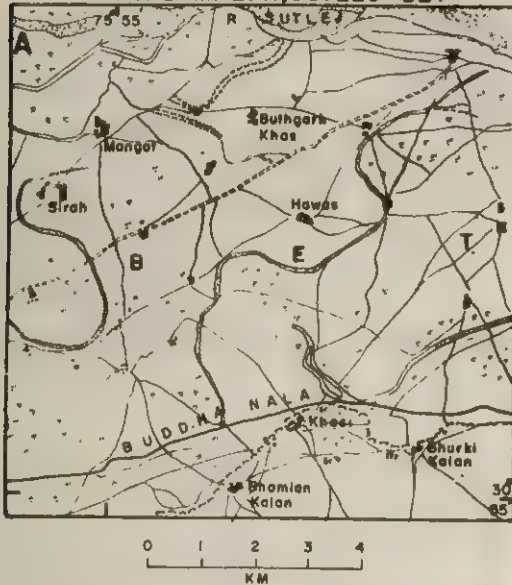
$\frac{1}{2}$ km apart belong to the Rajput and the Brahman communities (Fig. 3.9 A). The *chos* of Hoshiarpur have given rise to the growth of large number of small sized rural settlements, which are less

compact than in the rest of the Plains. The larger villages are on high grounds between two *chos*. Where the valley of the *cho* is well defined and a high bluff is available, settlement has grown

along the *cho* (Fig. 3.9 B). In the Sutlej Bet also the villages are smaller in size, but more compact in character than in the *cho* region. On the *Dhaia* or high bank of the Sutlej, settlements are located on the edge of the bluff which is in general 2 to 3 m in height (3.10 A).

RURAL SETTLEMENTS

PUNJAB MALWA, SUTLEJ BET



WESTERN HARYANA, BAGAR TRACT

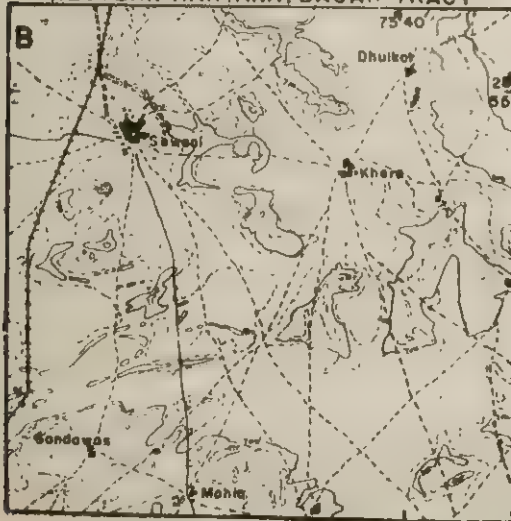


Fig. 3.10

Thus over the greater part of the Plains the rural settlements are highly compact, though there are considerable variations in their size.

Morphology of a Village

A look at a Haryana village, Dhandlayan (Fig. 3.11) reveals the internal character of a rural settlement representative of thousands of *Jat* villages. Situated about 16 km south of the Rohtak town on the Dighal-Beri road, it lies in the heartland of the Haryana *Jat* community. With a population of 2,026 persons it is one of the large villages. Having a total area of about 2,225 acres the village *abadi* (settlement) is confined to a small area of about 23 acres within the village *Phirni* (the boundary of the area earmarked for residential purposes which also includes some fallow and common lands).

Though there are about a dozen different castes living together, it was originally settled about 800 years back by some *Jat* families belonging to *Ablawat* clan of the adjoining village of Dighal. Their descendants comprise, by and large, the majority of the population, 301 *Jat* families out of a total of 368 of the entire village. Nearly all the land is owned by the *Jats*, *Brahmins*, *Nais* (Barbers) and carpenters have been granted some land by their *Jat jajmans*. The village community structure is a replica of the age-old social organisation of the Aryans. The *Jat* has performed the function of a *Krishak* (cultivator) with the same deftness with which he renders service as a *Kshatriya* (fighter).

The village *abadi* has taken a triangular shape, the south side forming the base and the apex lying in the north. A canal distributary runs to its southwest. The settlement has four sections (*paanas*) on the basis of the descendant lineage of the founders. Each *paana* has one *chaupal* belonging to the principal community, the *Jats*, where the *panchayats* are held. These community houses are also used for accommodating marriage parties etc. of the high castes.

The character of houses varies in its central and outer parts. Purely residential houses occupy the core area of the *abadi* while on the outer periphery there are mixed or dual-purpose houses having provision for keeping cattle and agricul-



Fig. 3.11

tural implements alongside a sitting room for the male-folk only. Haryana villages have a high percentage of *pakka* houses. In Dhandlayan about 80% of the houses belonging to the high castes are *pakka*. The roofs are generally flat. The *Harijans* have mostly *Kuchcha* (mud walled) houses which are situated in the south, aloof from the residences of the high castes. The artisan class, carpenters and weavers, however, reside in close proximity with the *Harijans*.

The water table in the area is very low, over 30 m, and the water is brackish. The wells have been dug around the ponds, where not only the water is sweeter, but the water table is also higher and there are lesser chances of the wells drying up in years of poor rainfall.

The village school, dispensary and the main *panchayat ghar* are all situated in the northeast on the opposite side of the road at the point of its entry into the village.

Agriculture

The importance of agriculture in the economy of the region can be visualized by the fact that

more than 70% of the people reside in the villages and almost 76% of the total area is actually sown (1960-61). Over and above this there is a considerable acreage of current fallows. The percentage of net area sown to the total area of the respective districts (1960-61) shows wide variations; it is as high as 88.2 in the case of Jind and as low as 53.4 in the case of Rupar. The districts of Bhatinda (87.6), Sangrur (84.3), Hissar (84.2) and Mahendragarh (82.7) all have more than 4/5th of their area under cultivation; while Patiala (79.5), Ferozepore (79.2), Ludhiana (77.8), R. H. T. (77.1), Jullundur (76.4) and Gurgaon (75.5) all have 75 to 80 percent; and Karnal (69.7), Kapurthala (67.0), Amritsar (63.7) and Gurdaspur (61.7) record a lower percentage. Patiala (59.4), Hoshiarpur (56.1) and Rupar (53.4) - the three submontane districts have the lowest percentage of the cultivated land.

The predominant feature of the agriculture is the wide variety of crops grown and the preponderance of the food over non-food crops. In 1965-66 food crops occupied (outside UTD)

68.4 percent of the total area cultivated, showing a fall over 1950-51 (78 percent). This is due to a large scale increase in the area under cash crops—sugarcane and cotton.

There are two main crop seasons : the *Kharif* (June-August to September-December); and the *rabi* (October-November to April-May). The major *kharif* crops are bajra, maize, *jowar*, cotton, rice and sugarcane. Among the *rabi* crops wheat, gram, barley and mustard are notable. By far the most important crop from the standpoint of area occupied is wheat which had 2,226,000 hectares in 1965-66. This accounted for nearly 25 percent of the gross area cultivated or 36.3 percent of the total area under food-grains.

Excepting the Mahendragarh district, practically all areas of the region have a substantial wheat acreage under it. It is the dominant crop over the irrigated areas of Malwa Plain. In Haryana, Karnal (31.0%) and Rohtak (23.0%) alone account for over 54% of the State wheat acreage.

Both the Doabs—Upper Bari Doab (19.0%) and Bist-Jullundur Doab (19.0%) together have about two-fifth of the total wheat acreage of Punjab, though Ferozepore alone has more (21.5%) than either of the Doabs. The acreage under wheat has been increasing in the dry zone of the south, where in the Haryana region alone the wheat area almost doubled between 1950-51 and 1965-66. In 1966-67 the region with 3,519,000 metric tons of wheat production was second to Uttar Pradesh (4,253,000 metric tons) in the country.

The next important cereal is *bajra* which is almost entirely grown in the dry and sandy districts of the south. In 1965-66, three districts of Hissar (32%), Mahendragarh (20%) and Gurgaon (14%) had over 66 per cent of the total acreage under *bajra* in the region. It is both a cereal and a fodder crop. Bharinda (9%), Rohtak (8%), Jind (6%) and Ferozepore (5%) also have substantial areas under it.

TABLE 5

Area under principal food crops—1965-66 (Thousand Hectares)

	Wheat	Gram	Bajra	Rice	Maize	Jowar	Barley	Pulses (excluding gram)	Others	Total
Haryana	678	868	780	192	88	248	117	47	3	3,021
Punjab	1,548	603	156	293	385	4	67	42	1	3,099
Total	2,226	1,471	936	485	473	252	184	89	4	6,120

Next to wheat is gram, a multi-purpose crop occupying about 16.2 percent of the gross cultivated area. It is of overwhelming importance in the drier plain south of the Sutlej. The chief districts are Hissar (24%), Bharinda (13%), Ferozepore (11%) and Rohtak (11%).

Among other cereals are barley mainly grown in the drier parts, and rice becoming important in the wetter and water-logged and some of the canal-irrigated districts of the region. Karnal has the largest area (over 26%) under rice among the rice growing districts (1965-66). Amritsar (14%), Gurdaspur (13%), Ferozepore (9%), Patiala (9%) and Ambala (8%) too, have substantial acre-

age under rice. The production in 1965-66 was 497,000 metric tons whereas in 1950-51 it was only 150,000 metric tons.

Jowar and maize which are both cereal and fodder crops attain importance—the former in the drier and the latter in the comparatively wetter parts. Jowar which is almost entirely grown in Haryana state is important in every district except Hissar. Maize, on the other hand, is largely grown in the districts of Jullundur (12%), Hoshiarpur (13%), Ludhiana (12.5%), Amritsar (11.0%), Karnal (10%) and Ambala (7%), together accounting for about two-thirds of the regional acreage. The two states of Har-

yana and Punjab together produced 749,000 metric tons of maize in 1965-66, while the production of Jowar was only 34,000 metric tons-entirely from Haryana. The production of jowar has shown a decline from 78,000 tons (Haryana) in 1950-51 to 34,000 tons in 1965-66.

Among the traditional cash crops cotton is the most important, though the acreage under sugarcane is also increasing. Since Partition due to the loss of the main cotton producing regions of West Punjab and Sind (Pakistan), there has been a marked increase in the area under cotton, more especially under the long staple American cotton. The districts south of the Sutlej are the main cotton producers, and their importance in cotton can be seen from the fact that over 91 percent of the total acreage of the region under cotton is to be found here. Ferozepore, Hissar and Bhatinda are the chief cotton producing districts. In 1946-47, the area south of the Sutlej had almost negligible acreage under American variety, except in the Ferozepore district which had more area under it than under *desi* cotton. By 1956-57 the acreage under American variety had increased manifold, whereas that of *desi* variety had registered a fall in most of the districts. In 1965-66 the Haryana state portion had more area under American variety of cotton than under *desi* cotton. In the Punjab state portion, however, *desi* cotton had a higher acreage than American variety. The American cotton is now largely grown in the districts of Ferozepore, Hissar, Bhatinda, Karnal, Amritsar, Patiala and Ludhiana. The rise in production of cotton can be judged from the fact that whereas in 1950-51 the region produced 0.264 million metric tons of cotton, in 1966-67 its production was over one million metric tons. Practically all cotton is grown (97 percent) under irrigation. The region stands 5th in cotton acreage (7.8%) in India after Maharashtra (2.6 million hectares), Gujarat (1.7 million hectares), Mysore (0.98 million hectares) and Madhya Pradesh (0.82 million hectares).

Sugarcane is a crop which is becoming important in the canal-irrigated areas and other

districts with adequate water supplies. The two most important districts in sugarcane acreage are Rohtak and Karnal. Gurdaspur, Ambala, Jullundur and Gurgaon districts also have over 20,000 hectares each. The total area under sugarcane was 147,000 hectares in 1950-51, which rose to 248,000 hectares in 1965-66 and to 306,000 hectares by 1966-67. The production in 1966-67 was, however, lower (945,000 metric tons) than in 1965-66 (1,294,000 metric tons).

In the production of rape seed and mustard the region is second only to Uttar Pradesh in the country. In groundnut production Ludhiana is the most important district followed by Sangrur, Patiala, Jullundur and Kapurthala.

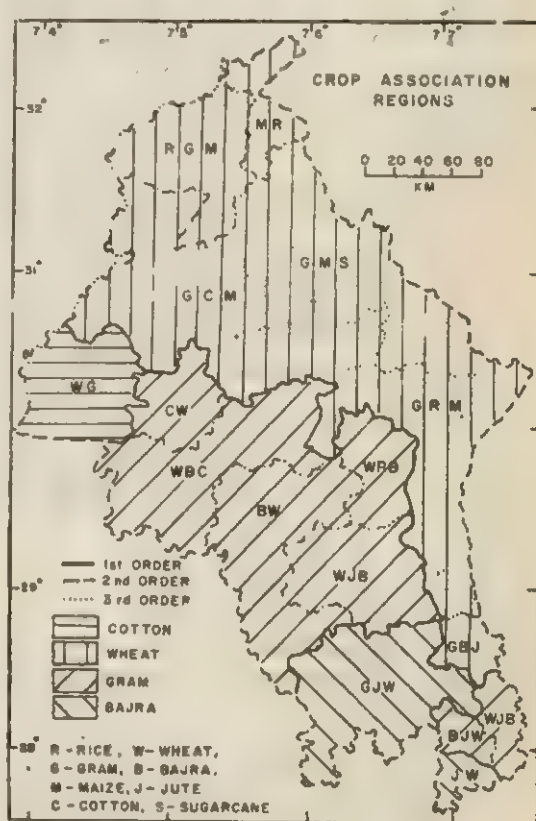


Fig. 3.12

Crop Association : The increasing aridity from northeast to southwest is clearly reflected in the

crop associations (Fig. 3.12); crops requiring less water are more important in the south and those thriving under humid conditions occupy larger areas in the north and northeast. As the crops in the Plains do not occur in monoculture, crop associations are determined through ranking; the crops, according to the percentage to the total cropped area occupied by each one of them (tahsilwise), give 4 first order regions :

(1) The northern and northeastern areas have wheat as the predominant crop with rice, gram and maize following in descending order in much of Upper Bari Doab and Kapurthala tahsil; whereas wheat is followed by maize and sugarcane in the Bist-Jullundur Doab, parts of Rupar and Ambala districts. In eastern Ambala, Patiala, northern and eastern Karnal and eastern Rohtak, the second and third ranks are taken up by gram and rice, while the fourth crop is maize, and sugarcane becomes the 5th crop in the tahsils along the Yamuna.

(2) Southern Ferozepore being very dry has cotton as the first order crop followed by wheat and gram.

(3) The south-central dry zone has gram as the first order crop with cotton, wheat and bajra becoming second order crops in its different parts (Fig. 3.12) depending on water and soil characteristics.

(4) Mahendragarh and western Gurgaon comprise the fourth region where bajra is the first order crop. In eastern Gurgaon gram again becomes the first order crop.

Irrigation : As emphasised earlier, much of the region being situated at the far end of the monsoonal currents is characterised by an insufficient and erratic rainfall and the agricultural prosperity of a large section of its area was dependent on the mercy of Nature. Wells were, however, the most important indigenous means of irrigation. In the Bist-Jullundur Doab 89 percent of the irrigation is done by wells including tubewells (1966-67). Another significant region is the eastern part of the Ghaggar-Sutlej interfluvium (over 74%). Even the Upper Bari Doab with ample canal facilities has more than 39 percent of the irrigated area under wells.

Ambala in the sub-montane tract and Mahendragarh in the dry south have 62.5 percent and 60.7 percent respectively of the net area irrigated by wells (1965-66). But both these districts have however, irrigation facilities for only 7 and 10 percent respectively of the net area sown. These districts thus lack irrigation facilities.

Much of southern Malwa Plain—comprising the districts of Ferozepore, Bhatinda and Sangrur and the adjoining southern districts of Hissar, Jind and Rohtak have canals as the most important source of irrigation. Amritsar in the Upper Bari Doab and Karnal in the Kurukshetra plain of eastern Haryana also have fairly good canal irrigation facilities. Since Partition and more especially with the completion of Bhakra canals, there has been a considerable increase in the irrigated area, especially in the dry south. The following table shows that the district of Hissar has got the maximum benefit from the Bhakra canals, where the percentage of the total irrigated area to total cropped area increased from 16.1 in 1950-51 to 42.5 in 1965-66.

Canals had been built in the region even before the British rule, but the extent of land irrigated by them appears to have been limited. The most important was the Western Yamuna Canal (Fig. 3.13) which was built by Feroz Shah III in the middle of the fourteenth century (A.D. 1356) and carried waters upto the newly built town of Hissar. It is, however, uncertain whether Feroz Shah's canal derived its water supply from the Yamuna or from the Chautang nadi. From the middle of the 18th century the canal remained in disuse till reopened by the then British Government in its present form about 1873. The largest branch of the canal is the Sirsa branch (185 km) which takes off at Indri. This branch rendered secure 81 thousand hectares by 1896-97, this rose to 1.05 million hectares by 1947 and 1.2 million hectares by (1956-57) as a result of remodelling and extension. The entire area in the Sirsa Branch and a few other parts of this canal has since been transferred to the Bhakra system, while the Sunder and Bhalaut sub-branches have been provided water supplies from 256 tube-wells of the Jagadhari tube-well scheme.

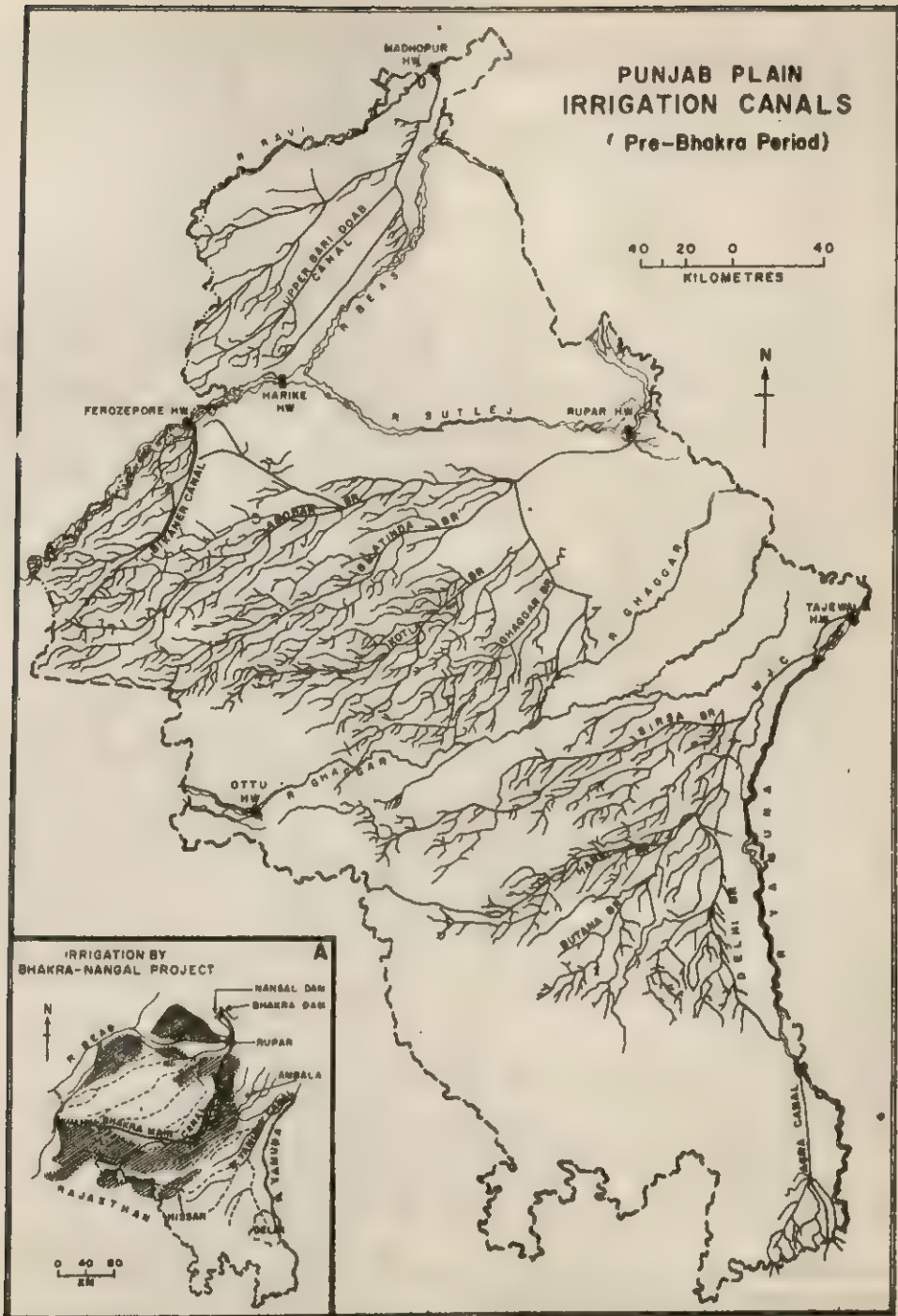


Fig. 3.13

TABLE 6

Gross area of crops irrigated as percentage to total cropped area

State	District	1950-51	1965-66
Haryana	Hissar	16.1	42.5
	Rohtak	32.0	36.2
	Gurgaon	12.6	19.4
	Karnal	37.7	54.1
	Ambala	...	16.9
	Jind	...	53.4
	Mahendragarh	4.3	4.9
	Total	...	35.5
Punjab	Gurdaspur	38.7	47.8
	Amritsar	83.2	91.2
	Kapurthala	54.5	71.7
	Jullundur	52.5	71.6
	Hoshiarpur	10.5	23.6
	Rupar	9.5	21.1
	Ludhiana	52.1	71.1
	Ferozepore	59.4	70.5
	Bhatinda	46.3	60.3
	Sangrur	67.4	71.6
	Patiala	37.8	57.8
	Total	52.3	64.3

The construction of the Upper Bari Doab Canal (1849-59) and its permanent Madhopur headworks (1875) had greatly helped in converting a less developed region into a highly cultivated tract. During the First Five Year Plan, 28 non-perennial distributaries and minors were added to this canal and its annual irrigation acreage increased from 238,042 hectares in 1947-48 to 370,469 hectares in 1956-57.¹³

The low lying areas along the Sutlej benefited considerably with the construction of the 14 inundation canals known as Grey canals (1875-1883). These canals were constructed and maintained on a cooperative system, the excavation work having been done by cultivators to be benefited.

The Eastern Canal also takes off from Ferozepore weir on the Sutlej. To ensure regular supplies of water into these canals after the comple-

tion of the Bhakra canals, the Madhopur-Beas-Link Project was constructed so that surplus water of the Ravi could be diverted to these canals through the river Beas. In like manner, Harike Project was undertaken to safeguard the interests of the area served by Eastern Canal and Grey Canals. A barrage was constructed beyond the confluence of the Beas and the Sutlej at Harike and through the Ferozepore Feeder the Canals were linked with this barrage. It also diverts waters into the Rajasthan Canal through the Rajasthan Feeder for irrigating the desert of Western Rajasthan.

The Sirhind Canal with its headworks on the Sutlej at Rupar was opened in 1882. It has three main branches—(1) Abohar Branch, (2) Bhatinda Branch and (3) Patiala Feeder. The entire canal system and the headworks were remodelled as a result of the Bhakra-Nangal Project. The annual irrigation acreage from these canals increased from 8.4 lakh hectares (1947-48) to 11 lakh hectares by 1956-57.

The Kaithal tahsil of Karnal district was provided irrigation facilities by constructing a *bund* in 1895-96 across the downstream end of the Bibipur Lake which is fed by the Saraswati and Markanda. The supply of water was, however, uncertain. The area now gets regular supplies from the Narwana Branch of the Bhakra Canal System and in 1956-57, the annual irrigated area was 22,274 hectares. New irrigation canals of an aggregate capacity of 15,585 cusecs i.e., Bhakra Main Line which takes off from the tail of the Nangal Hydrel Canal, Bist Doab Canal which takes off at Rupar (irrigating Jullundur and Kapurthala districts) and Sidhwan Branch which takes off from the existing Sirhind Canal, have been completed.

These canals will ultimately command an area of 2.6 million hectares in the region (Fig. 3.13 A) and the Marusthali out of which 1.6 million hectares are at present virgin waste land.

Industrial Economy

The region, deficient in mineral resources, especially the two basic minerals—coal and iron, and being largely agricultural, lacks the basic ingredients for the development of large scale

industries. In fact, before independence industrial development was rather on a modest scale. Though factory industries were established as early as the last quarter of the 19th century, yet the pace of industrialisation was quite slow. Even to-day, with hardly 5 percent of the people engaged in household and manufacturing industries (1961), the region is certainly underdeveloped industrially, the workers engaged in the registered factories form only 1.05% of the total population. However, the industries are quite widespread, comprising mostly small units. With the exception of Jind, all districts have a fair number of registered industrial units. The most industrialised areas, however, are the UTD (23.7%), and the districts of Gurgaon (11.6%), Amritsar (9.7%), Ludhiana (8.7%), Ambala (8.6%) and Jullundur (7.4%) and together account for nearly 70% of the workers employed by the registered factories. Of the industries of the region—the textile group comprising cotton, woollen and silk including powerloom weaving, hosiery, carpet weaving and machine embroidery is the most important and employs over 31% of the workers in the registered factories. Next to this is the light engineering group viz—agricultural implements, cycles, sewing machines, machine tools, steel rolling and metal foundry, non-ferrous metals, water pipe fittings and wood and machine screws—which employs nearly 24% of the workers. The major industries show a distinct concentration along the principal rail and road routes—the Grand Trunk road and the main railway lines from Calcutta and Bombay, showing two well-marked major industrial regions (Fig. 3.14) :

(1) The Northern Industrial Band running from Yamunanagar—Jagadhari near the Yamuna in the east to the Upland Plain of the Upper Bari Doab in the west, and (2) South-eastern Industrial triangle—with Faridabad, Delhi, Sonapat and Panipat line forming the base in the east and Hissar town lying at the apex in the west.

The Northern Industrial Band : Within this Industrial Band the major industrial towns show a concentration in 4 industrial districts. They are from west to east : (i) Upper Bari

Doab Industrial Core with Amritsar City lying at its southern and Dhariwal at the northern end. (ii) The West-Central Industrial Complex of Jullundur, Ludhiana, Nawanshahr and Hoshiarpur. (iii) The East-Central Industrial District of Ambala, Rajpura and Patiala. (iv) The Eastern or Yamunanagar-Jagadhari Industrial Complex.

With 1,585 registered factories (1,310 working) employing over 30,000 workers, the Upper Bari Doab Industrial region is one of the most industrialised. In fact, Amritsar along with its surrounding industrial centre of Chhaharata constitutes the industrial and commercial centre of the Punjab State. Amritsar, having more than 1,100 small scale units in various textile centres of the country: "90 percent of India's total installed capacity of woollen weaving industry in the decentralised sector is concentrated in Amritsar, besides almost 40 percent of the entire warp-knitting industry in India".¹⁴ Though the industry had started before Independence and was benefited much by World War II, yet expansion on a large scale took place only after Independence when the worsted spinning sector was built up between 1950 and 1956 and the wool combing mills were set up between 1961-1964. Only about a quarter century back Amritsar was primarily a trading centre for woollens, but now it houses about 25 large and 400 small scale units which manufacture a great variety of woollen textiles including fine varieties, for export, apart from meeting requirements of defence, hospitals and the railways. In art-silk weaving industry Amritsar occupies third place in the country after Bombay and Surat. The nylon fabrics industry, although a recent development, has become significant. Amritsar art silk products are also exported to several neighbouring countries. The other industries of Amritsar include machine tools, agricultural implements, electric goods, chemicals and food processing.

The next industrial centre is Batala with 400 registered small scale units, manufacturing machine tools and agricultural implements. The skilled class of blacksmiths in the rural areas and



Fig. 3.14

local enterprise have largely been responsible for the foundry and engineering industries of Batala.

The third centre of industry of the region, Dhariwal, is the oldest centre of woollen industry in India. The Egerton Woollen Mills was established in 1880 and is the biggest in Punjab.

Of the West Central Industrial Complex, the two major centres are Ludhiana and Jullundur. The establishment of sports goods industry at Jullundur is the direct outcome of Partition. Formerly the industry was concentrated at Sialkot (W. Pak.). By 1954 Jullundur had 125 units employing 2,500 workers. Most of the units are small and even large sized units employ techniques of production similar to those of small scale units. The location of the industry also has been influenced by the availability of wood which is obtained from the forests of Himachal Pradesh, and Kashmir. The industry, however, is not very well organised and there is scope for much improvement. Jullundur and its neighbouring towns of Goraya, Phagwara and Kapurthala have established a great variety of light engineering industries, like sewing machines, agricultural machinery, diesel oil engines, motor parts, cycle parts, ball-bearings, watermeters and musical instruments, etc. There are over 1,800 small scale units.

Hoshiarpur has several rosin, turpentine and varnish manufacturing units.

By far the most important centre of industry in this region is Ludhiana which has become a major centre of hosiery and hosiery machines, textiles, sewing machines, cycles and parts etc. The origin of the hosiery industry can be traced back to the beginning of the 19th century. Growth of the industry was rather rapid after 1884 when machine was employed for the purpose and by 1910 the town of Ludhiana had 25 factories. Prior to the World War I the manufacture was confined to cotton-socks and stockings. In the post I-War years the industry took to the manufacture of woollen garments. The Rachel loom (1927) and the hydro-electric power supply (1933) facilitated cheaper production on a mass scale. Introduction of Japan-made sewing and overlock machines (1934) revolutionised the

hosiery industry and the total number of machines working in the town before the commencement of the Second World War was 1,900 as compared to 16 in 1932 and 100 in 1941. In 1947 there were 23 hosiery factories employing more than twenty workers each, the biggest employing 127 workers. The hosiery industry gave rise to the growth of knitting machines manufacturing industry in 1923. The Punjab Mechanical Works Ltd. (1935) was the most important unit. After independence, hosiery textile industry made rapid progress and by 1953-54 there were about 800 concerns, employing nearly 25,000 workers. Formerly yarn was imported but now about 50% is met from local supply, mostly from the two wool spinning mills, which produced 0.9 million lbs of yarn (1953-54). The woollen industry in Ludhiana had 7,600 spindles and employed about 500 workers (1956). At present the number of small scale units engaged in making various types of hosiery goods is over 1,600.

Of the three industrial towns of this region Ambala is the oldest. It was the centre of a prosperous glass industry even before the 1st World War. During the thirties Ambala Cantonment developed as a centre for scientific instruments industry and ever since it has continued to progress in this direction, manufacturing optical, electrical, mechanical and surgical instruments.

Patiala has developed electrical, steel forging, biscuit making and a variety of miscellaneous industries. Rajpura has become an important centre for light engineering and biscuit making industries.

The twin-towns of Jagadhari and Yamunanagar, which have a wide market on account of good rail road connection have attained great industrial importance since independence, though Jagadhari is an old centre for manufacturing brass utensils and now has over 750 small scale units.

Taking advantage of its situation Yamunanagar was selected for the establishment of a sugar factory in 1935. The site was to the west of Jagadhari railway station. About the same time Shri Gopal Paper Mills Ltd.—the only paper mill of the region was established to the north of the railway line, which, in 1953 had an annual

capacity of 15,000 tons and employed about 1,500 workers. A starch factory was also added in 1939. The industrial activity was boosted with the establishment of an industrial township, when also was added the saw milling, which registered 20 mills in 1956, apart from a very large number of unregistered small units located there.

South Eastern Industrial Triangle : Though some of the industries of Delhi, Panipat and Bhiwani are old established, yet the present industrial landscape of this entire region is largely a post-independence development. The blanket manufacturing industry of Panipat and surrounding villages is fairly old, and in about 1917 produced about 200 blankets a day. Panipat had also developed a small glass industry and utensils making industry about that period. In the thirties woollen industry was established at Panipat and Kharar and in 1956 the city had three silk textile mills. Panipat, however, specialises in handloom products, particularly woollen blankets and *kher*, turned out by over 125 registered small scale units (1965). A sugar factory having a crushing capacity of 1,250 tons a day has also been established here.

Newly installed industries include a large number of units engaged in the production of agricultural implements, steel rolling, pipes and trunks and chemicals, majority of which have developed in the planned industrial area. Nearby, Sonapat has assumed great industrial importance since independence. Apart from the large cycle manufacturing unit—the Atlas Cycles (1951-52), the Sonapat industries include glass bottles, agricultural implements steel furniture, automobile parts, weighing machines, electric poles, cycle parts, machine tools, chemicals, rubber goods and optical lenses etc. An industrial area has been planned for housing the newly developing industries.

South of Delhi, the Faridabad Township has been newly developed primarily as an industrial centre to rehabilitate the displaced persons in industries by government help. The development of the industries has been phenomenal. Engineering industries, glass and products, rubber and rubber products, chemicals, leather goods,

refrigerators and other electrical appliances and a host of other industries have been established here.

To the south-west and west of Delhi, the same industrial pattern characterises the towns of Gurgaon (rubber goods, crockery, cutlery, padlocks, automobile spares); Bahadurgarh (electrical goods, pottery, sanitary wares, laboratory glass-ware, optical lenses, stainless steel instruments and hospital equipments, radio parts, cycles and parts, machine tools and special varieties of paper); and Rohtak (sugar, cycle and automobile parts, electrical goods, surgical instruments, agricultural implements, etc.). Of these Bahadurgarh is by far the most important centre where an industrial township has been built along the Delhi-Hissar road.

Bhiwani, further west, a cotton textile centre before 1915, having 287 looms and 12,728 spindles (1917) added another cotton mill later. Since Independence considerable development has taken place in this industry due to increased acreage under cotton. 9,000 spindles and 127 power looms were added to these two mills thereby increasing the total spindles to 32,572 and the power looms to 728. The mills have spinning, weaving, dyeing and printing sections.

The Hissar Textile Mill started functioning in Hissar in 1955. The mill has been started to take advantage of the increased cotton production in the dry zone of Hissar, increasing its capacity to produce 25,000 lbs of yarn (capacity : 40,000 lbs). This factory on a sand-dune-infested extensive site, outside the town of Hissar, has created a nucleus for a new urban centre.

Cotton ginning and baling and wool baling and pressing industries started in the early decades of the present century, employing a large number of workers, over 17,500 in cotton ginning and baling alone. The growing acreage of long staple cotton in the region is bound to bring about expansion and stability in the industry which it had lacked for quite a long time. These mills are mainly located in the dry zone, the chief centres being Moga, Muktsar, Abohar, Fazilka, Bhatinda, Hissar, Hansi, Rohtak, etc.

It is evident from the foregoing account that the industries in the region are characterised by

the predominance of small units catering for the regional market. However, some products like the hosiery goods, automobile parts, some machine tools, etc. command a wider market.

Transport and Communications

Much of the economic development of the region has been made possible by the rail and road network which has imparted easy accessibility to most areas of the region. The total road length of about 17,674 km (1965-66) gives to the region an average of 18.5 km of roads per 100 km² of the area, and 82.5 km per hundred thousand persons. The roads are mostly metalled as the percentage of unmetalled roads is only 35. The metalled roads form a network which facilitates through traffic between all major centres of industry and urban population. Being a border region and strategically important, the Plains are served by five of the National Highways which all converge on the National Capital, Delhi. Of these two are entirely in the Plains. Highway No. 10 passes through Rohtak, Hissar, Fazilka and then on to its terminal point on the international boundary with Pakistan. This is the old southern route. The northern route is the traditional highway (G. T. Road) that after passing through Delhi moves north along the old bank of the Yamuna by the towns of Sonapat, Panipat, Karnal, Ambala, Ludhiana, and finally to Amritsar.

Road communication, however, suffers due to certain obstacles at river crossings which are unbridged. The chief are¹⁸ — (1) On the river Beas at Sri Gubindpur on Tanda-Sri Gubindpur road, (2) On the river Ghaggar on (a) Patiala-Kaithal road, (b) Patiala-Tohiana Hissar road and (c) Sirsa-Banwala road.

The absence of overbridges at the railway level crossings at Ambala, Rupsura, Ludhiana, Phillaur and between Jullundur and Phagwara cause considerable delays and inconvenience to vehicular traffic.¹⁹ In spite of this, the progress of roads has been quick and steady. During the British rule, when railways were built, the road development was eclipsed for quite some time. The railways initially were built for strategic reasons, but once the political hold of the British on the

Punjab was complete, things gradually changed and the railways came to be considered as arteries of commerce and trade. They naturally were quicker and better than road transport during those early days, though now the roadways are considered faster and more convenient for the movement of traffic and passengers both. Today, with 2,834 km of broad gauge and about 905 km of metre gauge railways, there are 3.91 km of rails per 100 km² or 17.5 km for every hundred thousand of population. The metre gauge railways serve mainly the dry zone of the south.

In the north there are two major break-off-bulk points—Kalka in the east and Pathankot in the northwest, where the trade between the plains and the hills (Himachal Pradesh) meets.

It would be evident from the accessibility map (Fig. 3-15) that the greater part of the Upper Bari Doab and Bari-Jullundur Doab, excepting the northern steeper slopes and much of Punjab-Malwa plain, have high accessibility. Only between Moga, Jerozepore and Kot Kapura towns there are areas which are over 8 km away from either a road or a railway line. In south, mainly in Haryana, there are several large pockets which are also over 8 km away from the principal lines of transport.

The towns of Chandigarh and Amritsar both lie on the air routes from Delhi to Srinagar and from Delhi to Kulu.

The Regions

Underlying the broad physical homogeneity and the uniform virile character of its people, there exist regional differences owing primarily to drainage and soil, cultural outlook of the people, past political set-up, economic development, and lastly, though not of least importance, the new politico-cultural setting of the entire region in the post-Partition period.

Although the influence of drainage in creating physical differentiations has already been noted, yet in any classification of the Plains into geographical regions two factors cannot be overlooked. Firstly, though the river Sutlej is a major drainage line and initially a factor of considerable natural consequence, yet in its present state

with the construction of dams and barrages at points of its emergence on to the plains; it ceases to be a factor to be reckoned with till it is joined by its large affluent, the Beas, though even the latter's capacity to revitalise the river is being neutralised by the new schemes under implementation. Hence, the insignificant river Ghaggar becomes a major natural factor in differentiating the area lying on its either side, up to the point where it itself gets lost in the thirsty lands of the sandy southwest. The other factor that has created differentiations of profound nature on either side of the river Ghaggar is socio-cultural. The dialect of the people and language over much of the region east of the river (Ghaggar) have been greatly influenced by Rajasthan and the Ganga-Yamuna Doab which have made them different from that of the regions lying northwest of the Ghaggar. Moreover, the Sikh influence peters out to a large extent as we move from the Upper Bari Doab—'the greatest domain of the Sikh devotion and Politics', into the region lying east of the river Ghaggar. These differences recently led to the bifurcation of the plains into the two newly created states of Haryana and Punjab whose boundary very nearly follows the river for a considerable distance. Thus considering all factors—physical, political and cultural, the Plains can be divided into 2 first order, 8 second order and 29 third order regions (see Regional Scheme and Fig. 3.16.) However, it should be noted that the micro regional boundaries can be as changeable as the entire political set up of the area has been since many of them are determined by socio-economic differentiations. The dynamic character of the region should not be forgotten in any future consideration of the Plains.

Thus, whereas the politico-cultural variations have imparted distinctiveness to the two first order regions, the perennial rivers, more especially the Ravi, the Beas and the Sutlej, have interfluvial regions which are clearly distinct physical units. South of the Sutlej, the interfluvial zone between the Ghaggar and the Sutlej is a broad physiographic region whose extensive parts were till recently under the political control of the Phulkian rulers.

The Punjab Plain South (Haryana) has clear cut distinction in its northern, eastern, western and southern regions. All the four differ from one another in relief, climate, soils, sub-soil water characteristics, and economic development and population densities.

3. Punjab Plain North

a. Sub-montane Belt or Hoshiarpur-Chandigarh Plain : It is a region characterised by a rather steep slope, more so in its northern part, and drained by large number of *Chos* with a relatively low water table (due to great deposits of gravel and sand). In the Hoshiarpur tract, lying to the west of the Sutlej, intensive soil conservation and afforestation measures have been undertaken by the Punjab Forest Department for over two decades. It is characterised by small villages and the percentage of irrigated land to net area sown is only 19. Though the cropping pattern in the (i) Hoshiarpur region and (ii) Chandigarh-Rupar Plain is the same, wheat being the first order crop, yet the two regions have developed differently after Partition. With the construction of Nangal Dam and the establishment of fertilizer and other industries the region has been growing industrially. Again, the planning of Chandigarh has led to the large scale development of means of transportation, and several new urban centres like Kurali and the Capital itself have given new dimensions to its economic development.

b. The Upper Bari Doab : The Doab, though clearly a distinct unit having many common characteristics, reveals differences in its physiography, economic development and demographic characteristics. (i) The Ravi *bet* which was largely inhabited by the Muslims before Partition has undergone great socio-cultural transformation and its population now comprises mostly non-Muslims. (ii) The Beas *bet*, unlike the Ravi *bet*, was largely settled by the Sikh *Jats* even before the Partition and it has witnessed considerable agricultural development since Independence. In between the two *bets*, the Upland Plain, with better soil and drainage, is more intensively cultivated and has a higher density of population. (iii) The Upland Plain North differs from the (iv) Upland Plain South. The North has indus-

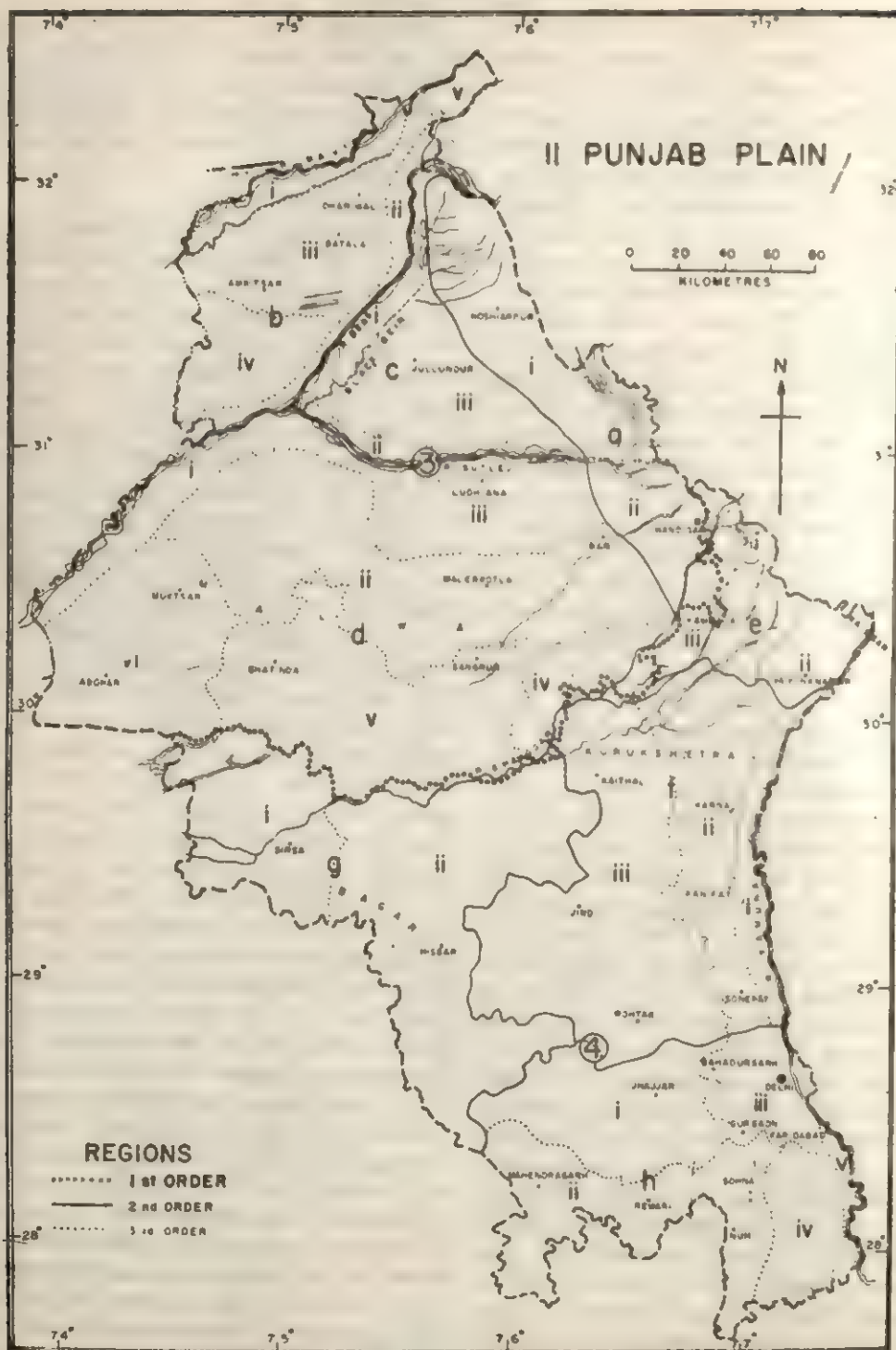


Fig. 3.16

trial development on a large scale while the South, also known as *Manjba*, is characterised by "ubiquitous agricultural landscape" with a considerable commercial farming (cotton) and an overwhelming majority of the Sikh population. (v) In the extreme north of Gurdaspur district there is the hill tract comprising about 325 km² which is a continuation of the Siwaliks. It is colder and rainier than the rest of the Upper Bari Doab.

e. *The Jullundur Plain* of the Bist-Jullundur Doab is characterised by the same tripartite division as the Upper Bari Doab. Both the Sutlej and the Beas rivers have extensive flood plains, though the westerly drift of the Beas has left a broad belt between (i) the Black Bein and the Beas which is badly drained and liable to extensive flooding. As compared to (ii) Jullundur Upland which is important for sugarcane, the Beas *bet* grows more rice. It is in industry that the Jullundur Upland is more important than the rest, and the density of population is one of the highest in the Plain region. (iii) The Sutlej *bet* is characterised by lower water table than the Jullundur Upland.

d. *The Punjab Malwa* : The major part of this region suffers from lack of surface drainage except in the east where the river Ghaggar and its seasonal tributaries drain the area. This is (iv) the plain of the tributaries of the Ghaggar. (i) There is a broad belt along the river Sutlej which is low-lying and its junction with *Dhia* (Upland Plain) is marked by a steep bank varying in height from 2 to 4 m. The Upland Plain is distinguishable into several third order regions on the basis of the predominant crops. Thus, (vi) the Abohar-Muksar Plain has cotton as the 1st order crop while wheat is relegated to the 2nd position. In (v) Bhatinda-Sangrur Plain, gram becomes the 1st order crop; while in Bhatinda, lying adjacent to the Muksar Plain, cotton occupies second place, in Sangrur wheat becomes the second crop. Further north the extensive (ii) Mudki-Malerkotla-Basi Plain is a region with wheat as the first order crop and gram is relegated to the 2nd place. (iii) The Ludhiana Upland Plain, though agriculturally akin to the Mudki-

Malerkotla-Basi region, yet by virtue of its large scale industrialisation, it becomes markedly distinct. It has the highest density of population (295) of all the districts of the Malwa Plain.

4. Punjab Plain South or Haryana Region

e. *Ambala Plain or Submontane Belt* : Though the entire region is characterised by seasonal streams or *Cbor*, yet its northern areas : (i) The Morni Tract and Kalesar Forest are hilly. The plain proper has two distinct units : (ii) The Ambala Plain East where the first and second order crops are wheat and gram but rice occupies the third place, and (iii) The Ambala Plain West has Maize as the third order crop. Both these have two distinct industrial nuclei—Yamunanagar-Jagadhri region in the east and Ambala industrial complex in the west.

f. *Eastern Haryana or Kurukshetra Plain* : Eastern Haryana with a comparatively higher rainfall and higher water table is quite distinct from much of southern and western Haryana. In its east, (i) The Yamuna *Khadar* running along the right bank of the Yamuna is a region where the river has been shifting at will since long. It is quite narrow in the north but broadens out to about 16 km in Karnal and Rohtak districts. This is a region of little urbanisation. (ii) The *Bangar* tract of Eastern Kurukshetra, a broad belt on an average 30 km in width, is agriculturally as well as industrially distinct from (iii) Western Kurukshetra Plain. The former has wheat as the 1st order crop and gram as the 2nd order crop, but the latter has gram as the 1st order crop and wheat, the 2nd order crop. There is a large scale concentration of industries too, in the Eastern which is more urbanised than the western and contains three important towns—Sonapat, Panipat and Karnal.

g. *Western Haryana* : This is largely a sandy plain with little rainfall. It has the lowest density of population in the plains. Its western part (i) the Lower Ghaggar and Naival Valleys or Sirsa region has gram as the first order crop and wheat occupies the second place, but further east (ii) the Bagar Tract and Associated Sandy Loam region being drier has bajra as the second order crop and wheat is relegated to the third place

Both these areas have very low water table though in the Ghaggar valley it is somewhat higher. In the eastern part of the Bagar tract Hisar is becoming an important industrial area.

(b) *Southern Haryana* : This region is more distinct than the rest of the Southern Plains because of a reversal of slope, hilly character, presence of sandy soils and absence of canal irrigation except (iv) Eastern Gurgaon Upland Plain where the canal irrigation is significant. This eastern part has gram, wheat and jowar as the first, second and third order crops whereas in the western parts bajra and gram are the first and second order crops.

In spite of this uniformity in the crops grown in the western part there is a distinction because of the physical conditions in (i) the Jhajjar and Northern Gurgaon-Mahendragarh Tract and (ii) the Aravalli Outliers and their Associated Gaps and Depressions. The latter are liable to floods during the rainy season owing to rainfall in the Hills and sudden increase of water in the north flowing streams, the Krishnawati, Dohan etc. In eastern Gurgaon, lies (v) the narrow flood plain along the river Yamuna, which though broader in the north becomes extremely narrow in the south. The most distinguishable area of Southern Haryana is, however, (iii) the Delhi Metropolitan region.

Delhi Metropolitan Region is significant for its functional individuality accommodating as it does the Federal capital of India. Besides being a natural point of convergence of routes from most parts of the country, Delhi's nodality is vastly enhanced by its cross-road strategic position in South Asia : it holds the Gateway position in the constricted space between the Peninsular edge and the Thar on the one hand and the Himalaya on the other, controlling the approaches to Malwa and other Peninsular lands, enjoining as well the marchland location 'between the NW, ever accessible to new waves of invasion and cultural intrusion, and the shock-absorbing Gangetic Plains. . . Few sites enjoy such advantages, and perhaps none save Rome and Istanbul have had such long-sustained significance'.¹⁷ In fact, Delhi area is an area where an array of

her creations played their games and quit the scene, leaving behind some remnants of their ambition and power and culture. It is the sum total of their monuments and physical relics and the cultural stamp left on the Indian people and the area that is what Delhi is to-day. There are visible evidences of more than thirty-odd centuries of history within the Delhi Triangle formed by the Ridge and the Yamuna, measuring about 181 km², it is studded with as many as sixteen sites of capital cities from the ancient In-

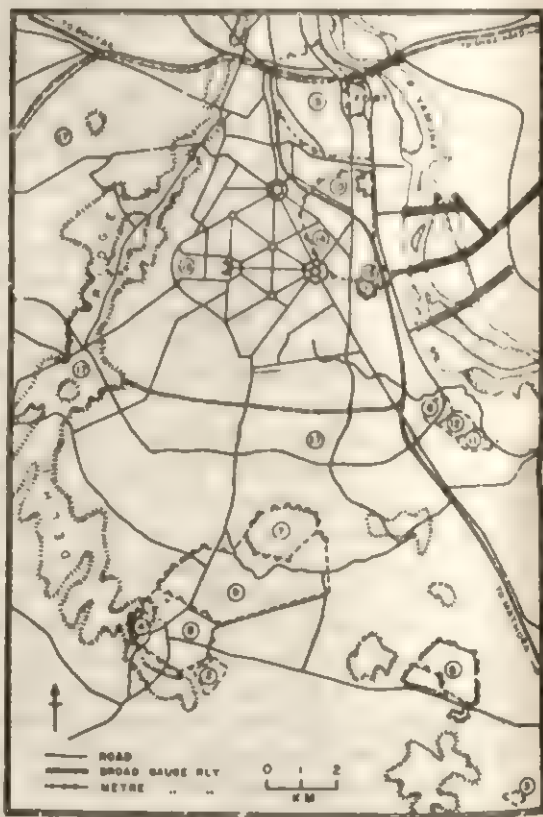


Fig. 3.17 : Sites of Delhi

Indraprastha to New Delhi (Fig. 3.17). Delhi, thus, imbibes the spirit of India and epitomizes her age-long culture and glory.

The earliest city, Indraprastha was founded in the pre-historic past on the right bank of the Yamuna as a capital during the Mahabharat period between the *Purana Qila* (old fort) and Humayun tomb. About c-100 B. C. Raja Dillu

of the Mauryan dynasty rebuilt the town and the present name is ascribed to him. After its decay, no new town seems to have come into existence till A. D. 1052 when as the inscription on the Iron Pillar suggests, Anangpal built Delhi—*Lal Kot* and later on Prithviraj built the citadel (*Qila Rai Pithora* in c. A. D. 1170) in old Delhi. Later, in the wake of the changing regimes of different dynasties of the Delhi Sultanate and later the various Mughal emperors, as many as ten new capital cities were built between A. D. 1288 to 1648, reflecting a mosaic of architectural styles and also symbolizing taste and whim of the monarchs. Shahjahanabad, and the Red Fort (perhaps re-modelled over some previous structure) were added by Shahjahan (1648), a prolific builder of palaces, forts and monuments. New Delhi, the modern capital, was planned by Edwyn Lutyens and Baker (1911) on a large site southwest of Old Delhi (Shahjahanabad) with spirit of the significance of its administrative and political functions.

The changes in the sites of the cities of Delhi suggest as much the whims of the builders as the locational disadvantages of many of them. The earlier sites on the spurs of the ridge in the south suffered from poor water supply; the post-1350 cities built on the western bank of the Yamuna were also badly sited and the floods brought about their abandonment and decay. But locations on the higher ground to the north proved safer and advantageous. The north-eastern areas along the Yamuna (Alipur Development Block), however, get flooded every year. Four embankments have so far been built to protect the low-lying areas from flooding.

In spite of all these drawbacks, the metropolis of Delhi with an estimated population of four million (1970)¹⁸ has grown from a city of only 200,000 people in 1901. This marvellous growth is largely a post-Partition development as in 1941, the population was only about 700,000 which more than doubled by 1951. It is the large scale opportunity of business and service in its ever increasing government departments combined with industrial development that has caused population explosion.

The UTD having an overall density of 1,791 per km², has the highest concentration in its urban areas (7,225 per km²) while the rural density is only 258. The total migrants into Delhi Territory (1961) numbered 1,638,087 or 61.6% of the total population. In 1961 Urban Delhi comprised three towns, Delhi Municipal Committee Urban (2,061,758 persons), New Delhi (261,545) and Delhi Cantt. (36,105).

The enormous growth of Delhi is also associated with the growth of industrial activities, and the metropolis is fast becoming a giant with a highly diversified economic base. The process of industrialisation of Delhi started towards the end of the 19th century, but the World War II and later, the Independence, gave a great fillip to industrial development. During one and a half decades (1950-65) the number of industrial units increased from 8,160 to 19,038.¹⁹ In the absence of any zoning regulation or a comprehensive plan for urban development most industries were located wherever space could be found. This led to overcrowding, traffic bottlenecks and unhealthy living conditions. Many industries had even penetrated into residential areas. A master plan for Delhi was prepared by the Central Public Works Department without any legal sanction. In 1955 Delhi had the necessary legislation to prepare a master plan which it could enforce. The largest planned industrial district at the time of the preparation of the master plan was along a part of the Najafgarh road. This district was planned and developed by the Delhi Improvement Trust in 1941. The other industrial areas were located along Kalkaji road, west of the Delhi-Mathura railroad and grouped around various industrial units like Delhi Cloth Mills, Birla Cotton and Weaving Mills, and Ganesh Flour Mills, etc. Many of these units were located in thickly populated residential areas. In 1962 when the Master Plan came into force, about 1.6% of the total urban area was under industries; now the Master Plan has earmarked about 5% of the total urbanisable space (110,487 acres) envisaged for 1981. The vigorous urban activity has led to spectacular urban sprawl beyond the Delhi Triangle, not only across the Ridge but

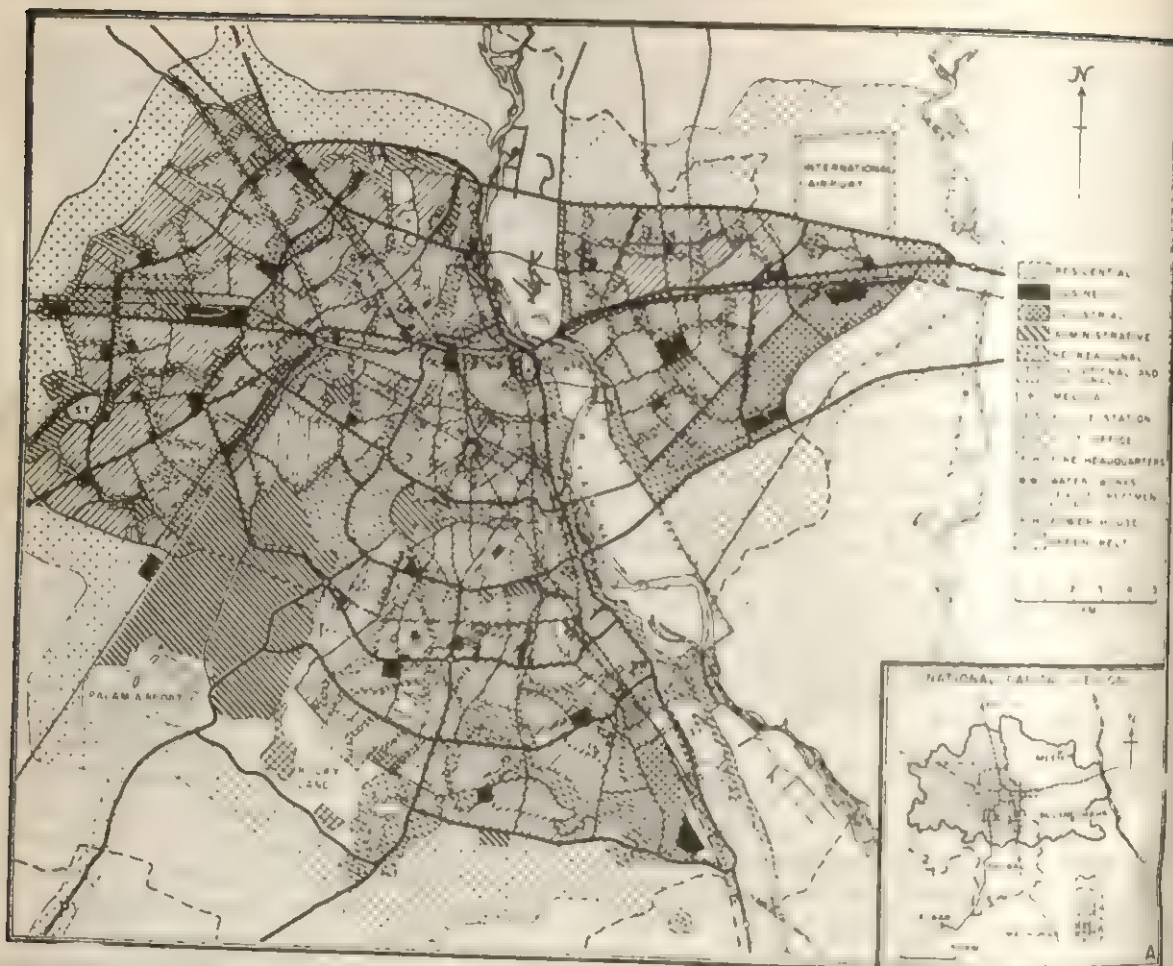


Fig. 3.18 : Master Plan of Delhi Metropolis

also on the other side of the Yamuna up to the Hindan between the two National bye-passes (Fig. 3.18). Thus, the Metropolitan region of Delhi has assumed a significant size. The Master Plan of Delhi envisages a balanced and coordinated development not only of the UTD, but also of the Metropolitan region.

Thus, the general plan has recognized three levels of regional set up (Fig. 3.18). Firstly, Delhi is a large metropolitan area with its sphere of influence over a number of rural, urban, and urban communities, which are, though with different intensities, functionally—both economically and socially, linked to the urban core. Ghaziabad and Loni in U. P., Faridabad, Gurgaon and Bahadurgarh in Haryana and Narela

within the UTD provide among others examples of such urban communities tied to Delhi. Secondly, Delhi is the centre of the 'National Capital Region' which comprises a number of towns and settlements 'which have been pronouncedly influenced by Delhi and which today show tendencies of growth related in one way or other to the growth of Delhi'. Rohtak and Sonapat, Meerut and Bulandshahr are such cases among others. The third level of planning is in regard to the urban core of Delhi itself "within which the daily economic and social activities are identified as wholly of Delhi."²⁰

The Master Plan, thus, recognizes the importance of Delhi as the national capital, as a regional capital—commercial and industrial, and

as a dynamic and vigorously growing urban core; as such it envisages a plan for expansion of Delhi as to accommodate the spatial and functional needs of the expanding giant i.e., not only to develop the areas immediately adjacent to Delhi but also a number of towns around it, like Ghaziabad, Bahadurgarh, Ballabhgarh, Gurgaon, Sonapat, Faridabad, etc., "as counter-attractions and catchments for the large population that is flocking towards Delhi every year" and to accommodate the industries and various tertiary activities. In fact, they are regarded as 'ring towns' in consonance with the regional urban planning principles and it is envisaged to develop them "in an integrated and coordinated manner with Delhi so that their planned expansion will not only help them to achieve a better economic and social base but also simultaneously to relieve Delhi" from the hard pressure for space and employment. However, the marshy and low-lying tracts on either side of the Yamuna are a bottle-neck to the stipulated development programme.

The entire urbanisable area of the UTD (by 1981) has for planning purposes been divided into eight planning divisions which are further subdivided into 136 development zones in order to have workable areas for detailed planning. The land use plan prepared by Delhi Development Authority has suggested removal of non-conforming uses where necessary. The suggested land use allots 42.9% for residences, 8.8% for commercial, industrial and government offices, 23.7% for recreation, 8% for public and semi-public facilities, 10% for transportation and circulation apart from 6.3% under cantonment, etc. Keeping in view the 'garden city' concept, a green belt of 1.6 km depth around the 1981 urbanisable limit has been proposed. Adequate community facilities (schools, colleges, hospitals, health centres, cultural institutions and shopping centres) have been provided in the plan. Slum clearance, controlled residential densities, proper supply of water and electricity and various other urban problems have been taken good care of. For smooth circulation of traffic, both metropolitan and regional, ring and arterial roads (60 to 90 m wide) have been provided.

Yet, the Delhi remains a metropolis of vast distances and transport still remains a problem for common man.

Scheme of the Regions

3. Punjab Plain North

a. Sub-montane Belt or Hoshiarpur-Chandigarh Plain :

- (i) Hoshiarpur Chos Belt
- (ii) Chandigarh-Rupar Plain

b. Upper Bari Doab :

- (i) The Ravi Bet
- (ii) The Beas Bet
- (iii) The Upland Plain North
- (iv) The Upland Plain South or *Manjha* Region
- (v) The Northern Hill Tract

c. Jullundur Plain :

- (i) The Beas-Black Bein Flood Plain
- (ii) The Sutlej Bet
- (iii) The Jullundur Upland Plain

d. Punjab Malwa :

- (i) The Sutlej Bet
- (ii) The Mudki-Malerkotla-Basi Plain
- (iii) The Ludhiana Upland Plain or *Daba*
- (iv) The Tributary Plain of the Ghaggar
- (v) The Bhatinda-Sangrur Plain
- (vi) Abohar-Muktsar Plain

4. Punjab Plain South

e. Ambala Plain or Sub-montane Belt :

- (i) The Morni and Kalesar Hill Tract
- (ii) Ambala Plain East
- (iii) Ambala Plain West

f. Eastern Haryana or Kurukshetra Plain :

- (i) The Yamuna Khadar
- (ii) Bagar Tract of Eastern Kurukshetra
- (iii) Western Kurukshetra

g. Western Haryana :

- (i) Lower Ghaggar and Naival River Valleys or Sirsa Region
- (ii) Bagar Tract and Associated Sandy Loam Region

b. Southern Haryana :

- (i) Jhajjar and Northern Gurgaon-Mahendragarh Tract
- (ii) Aravalli Outliers and their Associated Gaplands and Depressions
- (iii) Dehi Metropolitan Region

- (iv) Eastern Gurgaon Upland Plain
- (v) Yamuna Khadar Belt.

Problems and Prospects

From the foregoing it would be evident that the region is faced with a number of problems which warrant serious consideration and a cautious and timely approach to their solution. The progressive increase of irrigation facilities (mainly canals) during the last one hundred years has not been an unmixed blessing for the region. It has caused water-logging on a large scale and a considerable rise in the sub-soil water level, especially in Amritsar, Ferozepore, Hoshiarpur, Sangrur, Jullundur and Gurdaspur districts. Investigations have revealed that near Bhatinda the water table which was 45 m in 1895 has risen to a depth of about 21 m and that if this rise continues at the present rate, the water table will touch 10 m within about 20 years. In areas commanded by Bhakra Canals significant rise in the water table has already occurred. The average rise between 1955-61 has varied from about 2 to 4 m as against 0.5 to 1 m between 1949-55. It has also been observed that there has been a continuous rise since 1955, whereas in the pre-Bhakra Canals period, there was an oscillating trend. 'In the areas of the Bhakra Canal in the Pehowa Division in the tract between Markanda, Ghaggar and Narwana branch and the Bhakra Main Line Division, the water table has gone up considerably and is now very high.'²¹ There has also been a similar rise in Tohana, Fatchabad, Sirsa, and Ravi Divisions, but as yet the water table there is sufficiently low, and the situation for the time-being is not alarming. Immediate steps have, however, to be taken to see that the water table is checked from further rise, where it has reached about 10 m-depth or so, as in the Upper Bari Doab, Ferozepore district, especially in the Ferozepore Canal circle and Grey canals tract. In such areas construction of tubewells, wherever feasible, should be taken up.

The Hoshiarpur *Chos* region faces a serious problem of soil erosion and *cho*-infestation. This would be evident from the fact that the *cho*-infested area which was only 48,000 acres in

1852 rose to 94,000 acres by 1897 and 415,000 acres by 1939. Though in 1939 a Soil Conservation Division was formed and works were started in certain places, yet the situation to-day is that while the upper slopes which had been under complete protection for 25 years and free from Gujars' grazing and lopping for the past 10 years have completely been rehabilitated, the condition of the lower slopes where partial closure prevailed, is not satisfactory. Erosion is still severe and is contributing to the chronic *cho*-formation further down. In the latter areas, the threat to cultivation by sand deposits is still very real and the agriculture, except where levelling, terracing, etc. have been done, is unsatisfactory. This practically precludes the possibility of large areas being reclaimed for cultivation which are at present infested with grass which follows the movement of the sands, or cut-up by incipient gully erosion.²²

The abandonment of the reclamation programme by the Government in the areas at the foot of the hills has set a limit to the reclamation of land for cultivation though soil erosion continues. Under the existing policy the upper slopes will go on improving while the lower slopes will go on deteriorating and the latter will also be the case in the sloping land at the foot of the hills.

The exchange of closures between the upper and lower slopes i.e., the lower slopes being given complete protection while the upper slopes are kept open for light grazing would be highly beneficial. Soil erosion is common throughout the submontane tract which needs proper and adequate measures not only to check erosion on steeper slopes but also to protect the lower slopes and foot hill regions against silting and spreading of unwanted coarse sands. Wind is a serious agent of soil erosion in the dry south-western plain where nearly 0.5 million acres are affected. Green or forest belts should be established across the direction of wind to check wind action and also prevent the sand-spread over new areas.

The alluvial soil tracts of Amritsar, Ferozepore, Sangrur and Karnal districts suffer from a serious problem of saline and alkaline soils. Several other districts viz., Gurdaspur, Jullundur,

Kapurthala, Ludhiana, Patiala, Rohtak and Hissar too have the problem of salinity and alkalinity but to a lesser extent.

Whereas agriculture is faced by these serious problems, the industries which have made a tremendous progress in the past two decades are faced with an acute shortage of raw materials, especially raw silk and synthetic fibres for the textile industries, and iron and steel for its ever growing engineering and foundry industries. These shortages at times threaten the very existence of these industries, apart from resulting in the fall in the standards of the products manufactured. This also reduces the export potential of the industrial sector.

With the reorganisation of states, the region has been left with little forest area. It would be in the best interests of the region if forest area is progressively increased. A two-pronged drive from the Siwalik slopes in the north and the sandy tracts in the south should be launched. It will go a long way in minimising the severities of problems faced by the region.

The continuous process of political vivisection of the region into more units has retarded the

integrated economic development in this strategic zone and even now considerable regional disparities occur. For instance, of the two first order regions, the Haryana Plain stands in contrast to the Punjab Plain North. On sub-regional level also the western Haryana is a good contrast to the Eastern Haryana within the same region and is markedly different from the Upper Bari Doab.

The patterns of economic development would show that there is sectoral imbalance in the region. Except the two hubs along the industrial axis and the UTD, the region needs adequate attention towards the development of tertiary industries, for which the hydro-electric power from the Bhakra complex may be tapped. It is gratifying to note that the state government of Haryana has launched an extensive programme of rural electrification.

At the inter-regional level also some sort of integration between the Rajasthan Plain, the Punjab Plain and Himanchal through a common Development Board and, if possible, including the Kashmir region, would go a long way in developing the Western and North-western India.

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The Upper Ganga Plain is a part of the Great Plains lying approximately between the Yamuna in the west and 100 m contour in the east ($73^{\circ}3' \text{ E}$ - $82^{\circ}21' \text{ E}$ and $25^{\circ}15' \text{ N}$ - $30^{\circ}17' \text{ N}$), covering about $1,49,029 \text{ km}^2$ (about 51%) of the area of Uttar Pradesh. The region is delimited in the north by 300 m contour which separates it from the Garh-Kum Himalaya west of the Sarda while the international boundary of Nepal marks the limit towards the east. In the south the Yamuna demarcates its border with the Bundelkhand. The region markedly differs in physical, social and economic characteristics from the northern and southern bordering regions but it is devoid of any such limits on the west and the east where the lie of the land with imperceptible physical, climatic and economic variations seldom provide any landmark to put a precise divide between its counterparts, the Punjab Plain on the west and the Middle Ganga Plain on the east. In the west, however, about 250 year old State boundary which, by the large, coincides with the subterranean extension of the peninsular block and also separates the Indus and the Ganga drainage systems has been considered as its western limit, though the metropolitan influence of Delhi is penetrating into the Upper Doab. The problem of delimiting the boundary is relatively more intricate in the east. Baker's¹ two-fold division of the Great Plains i.e., the 'Indo-Gangetic Plain' West and East along the Sutlej-Yamuna divide had been too unrealistic, incorporating the drier Delhi-Agra axial region and the perhumid 'Bengal Delta' together. Even the limit drawn by Stamp² and later adopted by Spate³, roughly corresponding with the 100 m ($40''$) isohyet in his six-fold divisions of the plains, from the Lower

Indus valley (West Pakistan) to the Brahmaputra valley (Assam) is questionable. R. L. Singh⁴, while delimiting the Middle Ganga Valley suggested the Allahabad-Faizabad railway line which roughly coincides with the 100 m contour and happens to be a better compromise with the least possible administrative adjustments (tahsil level) as the demarcation between the Upper and Middle Ganga Valley. The departure from the line occurs beyond the Ghaghara where Balrampur and Utraula tahsils of Gonda district fall on to the West of the aforesaid contour though included in the Middle Ganga Plain. The distinctiveness of the two regions in respect of dominance of crops and cropping pattern is notable : there is overwhelming acreage (80%) of the cropped area under cereals with dominance of rice, a humid crop in the east, while wheat, barley and millets account for about 60% of the cropped land in the west. Thus, the 100 m contour adjusted with the administrative boundaries on tahsil level, as also rigorously established by S. C. Singh⁵, has been finally adhered to as the eastern limit of the Upper Ganga Plain.

The region, so defined, incorporates within its bounds (550 km E-W and 380 km N-S) the Divisions of Meerut (excluding Dehra Dun district), Agra, Rohilkhand, Lucknow, Allahabad (excluding the tahsils of Handia, Phulpur, Meja and Katchhara) and Faizabad (excluding the tahsils of Utraula, Balrampur, Faizabad, Tanda, Akbarpur, Sultanpur, Kadipur and Patti) and southern part of Haldwani tahsil of Naini Tal (Kumaun Division) (Fig. 4.1). Culturally, the region presents an amalgam of pre-historic to present culture, while politically, due to the proximity of the national and regional capitals, it has enjoyed relatively greater stability with interrup-



Fig. 4.1

tions occasionally during shorter transitions induced during the change-over of the dynasties. It is then that the local aspirants, like the *subedars* of Awadh tried to assert their supremacy. The more obvious regional contrasts at present between

this region and its counterpart, the Middle Ganga Plain in general and the East U. P. Plain in particular, owe more to the two hundred years of British rule which did not treat the two regions at par, rather than to the natural resource endowments.

Historical Background

The Upper Ganga Plain has anciently held a unique position in the march of Indian history from before the *Kuru-Panchala* days. It is the land east of the *Sapta Sindhu* of the early Aryan settlers and of Kurukshetra or Sirhind, or Sutlej-Yamuna Divide. It covers the ancient *Panchala* country in the Yamuna-Ganga Doab and Rohilkhand and Awadh Plains of more recent times. It is the nuclear area of India to the immediate west of which lies the Delhi-Agra filterzone—Delhi gateway strategically situated between the Himalaya in the north and the Aravallis and the Thar to the south, and Agra towards the south holding the approaches to the great Malwa Passage-way serving as the forward base for the powers in the filter and fulcrum zone. It has been the fate of this region to keep control over this axis to keep itself free or else stand subjugation and defeat if the Delhi gateway is forced open or the axis is run over. Invasion thrusts have been made into the Ganga Valley through this axis. As such, the axis area has been a cockpit of warring forces. It is on these grounds where the Great War of Mahabharata between the Kurus and the Pandavas was fought bringing about a great political and social upheaval. The battle of Thaneshwar between Prithviraj and Mohammad Ghori was fought in this zone and later the fate of India was thrice decided in the battles of Panipat here in Kurukshetra Plain—in 1526, putting the Moghuls in power, in 1556 re-establishing them and in 1761 when the Marathas were humbled down. It has been a part of the *Madhyadesa* or the Middle Country (the pivot of the *Aryavarta*) of the epics—the Mahabharata and the Ramayana, and the Puranas as also the Hindustan of the Muslim historians, in fact, 'the heart of India, typically Indian and securely Indian'⁶ from time immemorial. Every power with an ambition to rule India gravitated to grab it for only the securely held *Madhyadesa* could lead to Indian rulership, and hence all the invasions thrust into this part. "But its geography is the same from Ferghana to Kabul, from Kabul to Agra and with

Agra the Gangetic valley".⁷ Only the British being the sea power came from different directions, but they had to control it to control India. This region was also a prized possession on account of the relative richness of its resources. Thus, the nature of this region and its historico-political value have been intriguing, challenging and rewarding to the rulers of India.

Although the archaeological discoveries of prehistoric or protohistoric materials have not been plentiful, it is probable that the Ganga valley was occupied by man during remote ancient period, and the continuous cultural history seems surer enough from the little finds at hand though not dated properly. The location and geography of the region suggest a rich culture, at least not inferior though it may be a little later in development, to the Indus valley civilization. Its earliest occupants were perhaps the Negritos, followed by proto-Australoids, such as the Dravidians, Nishadas, Bharatas and others, referred to as *Dasas*. Probably they lived in villages and towns and carried rudimentary agriculture in forest clearings.

The Vedic hymns, composed as early as 2000 B.C. show that Aryan settlements had not extended east of the Yamuna by that time, and effective eastward movement commenced later. The expansion of the Aryans eastward was essentially through conquest as much as with conciliation, as their own stocks were limited; they could not help. Aryanising and absorbing the indigenous peoples as their strains became thinner and thinner with every advance further.⁸ As they became settled, they resisted the fresh Aryan invasions. The earlier Aryan territorial powers in the Kuru-Panchala region had to fight and destroy the attacking Aryans and could stop them with the help of the indigenous population which they had themselves subjugated and partly absorbed. "It was here that Indra, the Wielder of the Thunderbolt, the destroyer of the walled towns, is not on the side of the invaders but on the side of the Sudas and his allies",⁹ who fought decisively the battle of the Ten Kings involving the Rigveda's *Panchajanah*, i.e., *Apus*, *Druhus*,

Purus, Turvasas and Yadus, and other five tribes, viz., the Alinas, Bhalanas, Pakthas, Visanis and Sivis. This battle of the Ten Kings virtually put a stop to the fresh Aryan invasion and has been regarded as an epoch-making event in shaping the future course of Indian history. "It may well be claimed to have laid the foundation of Indian and Hindu Civilization for here it was that the synthesis of neo-Aryanism or Hinduism was laid",¹⁰ here it was that the 'Indian man' emerged as a result of the miscegenation of the Aryan and indigenous strains. Thus the synthetic Indian culture evolved and reached fruition, which has been so pervasive, resilient and continuous.

The later Vedic literature mentions other names such as those of the *Kurus*, the *Panchalas*, the *Vatsas*, *Kasis*, *Koshalas*, *Videhas*, etc., of the Ganga valley who were no longer the roving tribes but had settled down and had become territorial powers. Literary and other evidences suggest that the Aryans had crossed the Ghaghara (Saryu) before the first millennium B.C. The *Madhyadesa* had by then become the pivot of the *Aryavarta* which extended to the two seas. As mentioned in the Mahabharata, other parts were known as the eastern, southern, western and northern, surrounding the *Madhyadesa* which was, according to the Vishnu Purana, occupied by the *Kurus* and the *Panchalas*. It covered approximately the region from the Sutlej on the west through the Upper and Middle Ganga Plain and the Yamuna-Chambal catchment area up to and including the Son valley in the east.¹¹ The Upper Ganga Plain came to be the nuclear area for the Aryan expansion to the north, south and east; it was here that the epics were written, and also the *Brahmanas* and *Puranas* were contemplated. Surasen, one of the most important states, head-quartered at Mathura, was the area of Lord Krishna's achievements. Aryanism, neo-Aryanism or Hinduism, and Buddhism all prospered here. The region was originally covered with forests. The first Aryan colonies were established along the flood-free river levees by purifying the country through 'Agni' (fire), and it was in these forest-clad tracts that the

Aryans evolved their fire-cult as a weapon of clearing the forest or draining the marshes through *Agni-Bana* (fire-arrow). The expansive colonies grew into *Janpadas*, republics or Kingdoms—Kuru and Panchala were two large Kingdoms covering the Upper-Ganga Plain. Kuru Janpada was the land of the *Kurus*, originally the hinterland of Indraprastha (Delhi) west of the Yamuna where they first settled. Later, they extended their boundary across the Yamuna and the Doab to the Ganga in the east. The limits of the Puranic Kuru extended from the Ghaggar to the Ganga bounded on the north and south by dense forest belts. Indraprastha on the Yamuna and Hastinapur on the Ganga were the two capital cities. Kuru *Jangala* Janpada later originated by clearing the large Kuru forest.¹² *Panchala* Janapada, rival of Kuru, extended over modern Rohilkhand together with the central part of the Yamuna-Ganga Doab and northern-half of the Ganga-Ghaghara Doab, thus bounded by the Ganga in the west and the Ghaghara in the east. Its northern division had its capital at *Abichhatra* (Ramnagar in Bareilly) and the southern part was head-quartered at Kampila (Kampil) on the Ganga in Farrukhabad district between Budaun and Farrukhabad.¹³ The Ganga quite naturally formed the dividing line between the two Panchalas. Surasena dynasty had its suzerainty in Mathura region with that city as the capital as mentioned in the Mahabharata; it was the land of Lord Krishna who was honoured equally by the *Kurus* and the *Panchalas*.

The location of the region has always attracted trade channels to pass through the northern and southern parts.¹⁴ The trunk route from Udayanpura, Puskaravati and Taxila in the NW to Sravasti, Saketa, Kapilvastu, Mithila, Vaisali, Pataliputra and beyond to Tamralipti followed the Himalayan piedmont through Hardwar, Govisana and Ahichhatra, adhering as closely as possible to the foot-hills and avoiding the Tarai and flooded terrain and crossing the Himalayan rivers before they become formidable and extensive channels. The other route ran from *Jalandhara* (Punjab) to Tamralipti through the important regional cities like Indraprastha, Mathura, Kampil,

keeping to the south of the Ganga and further east, Kashi (Varanasi), Rohitagiri (Rohtasgarh), etc. This route was the forerunner of the modern G. T. road to which Ashoka gave a proper shape. The Indraprastha-Agra-Ujjaini, and Kaushambi Vidisa routes penetrated to the western and central India respectively, the former providing access to the west coast ports. The regional cities with their rich resources were thus active in the internal, coastal and foreign trade channels.

Later, the Magadhan national power annexed these areas into its orbit. The success of Magadh was due also among many other factors to its being out of the pale of orthodox Brahminism : "while the lands of earlier Aryan occupation, such as the Kuru-Panchala territory, seem by this time to have become priest-ridden, squandering much of the national wealth in expensive sacrifices, this was not the case with Magadh which was an early home of Buddhism and Jainism, which encouraged a somewhat more positive and realistic approach to life than did the sterile sacrificial Brahmanism of the regions further west."¹⁵ Macedonian Alexander was told on the river Beas that "the entire India beyond that river was in the hands of Xandrammes, presumably a Nanda King of Magadh". Thus, even before Chandragupta Maurya, the Magadh power controlled most of N. India. The Mauryans built up a highly organized administration and did much for economic development. Later centuries after Magadh's subsidence, except the brief interlude of Kushan empire engulfing this region, were of political uncertainty until about A.D. 320 when it fell under the sway of the Guptas. Being open to trade with the east and west coast ports, the region was under expansive economic stage. The Hun invasions rocked the area but Skandagupta banished them finally. In the weakening period of the Guptas the region again formed a cock-pit among the Maukharis of Kannauj, the Huns and the Guptas. However, the Maukharis of Kannauj rose to power. Harsha became the emperor of N. India. During his time Kannauj city was at the pinnacles of grandeur. Thaneshwar which included part of the Upper Doab was tri-

butary to Harsha, and such petty districts as Govisana (Kashipur) and Ahichhatra forming part of the Madawar state (Western Rohilkhand) at that time, and Vaisakha, Kusapura, (Sultanpur), Kaushambi and Prayag, etc., on the east formed part of the Kannauj power.

Later period saw political chaos and confusion, accentuated by the Muslim invasions, though the rural polity and social organization were being coordinated by the local Rajput, Jat, and other clan chiefs and the country was in prosperous condition. In A.D. 1016 Mahmud of Ghazni saw Kannauj, "a city which raised its head to the skies, and which in strength and structure might justly boast to have no equal".¹⁶ About A.D. 915 Kannauj was the capital of one of the kings of India as mentioned by Masudi. In A.D. 900 Abuzaid, on the authority of Ibu Wahab, refers to Kannauj as 'a great city in the kingdom of Gojar.'¹⁷ The repeated onslaught of the Huns, and later the Muslims, gave rise to the need of unity which was forged quite successfully but only occasionally and once the foreign invasion subsided, internecine warfare became the order of the day. It was out of the hatred and enmity between the Chauhan rulers of Delhi and Rathors of Kannauj that the Muslims could make a dent in the region. Mohammad Ghori could succeed in defeating Prithvi Raj (of Delhi) with the connivance and help of Jaichand (of Kannauj), and later the latter also, thus putting a severe blow to the regional powers. Attempts were however made again and again to consolidate the people of the region. A meeting of the traditional *Saru-Khap Panchayat* (a multi-caste structure) in A.D. 1201 was held to discuss the defeat of the Rathors and the Chauhans by Mohammad Ghori and it was decided 'to defend ourselves and to die for the defence of our religion'¹⁸ and 'to raise an army of 60,000 to 1,00,000 persons from various *Khaps* to defend the *Saru-Khap* area. But the unity was almost always for defence and resistance against some taxes like the *Zaria* or onslaught on religion and social affairs, or for making suggestion for agricultural and economic development. The local uprisings in the Doab and Rohilkhand were suppressed by the Muslims as

there was no large-scale organized resistance. For Delhi Sultanate and the Moghuls the Doab was the 'heart land', the granary and the economic hinge of the empire; Akbar shifted his capital from Delhi to Agra not only to control the Malwa passage-way but also the Doab and the southern fringe zone more tightly. The rulers tried to improve the agriculture and the economy in general in this region and the towns were not only centres of grain trade but also of handicrafts and other products. The local aspirants to power, however, were never quiet; with the falling days of the Moghuls, the Jats in the Doab, the Rohillas in the Rohilkhand and the Marathas in the south were out to control this nuclear area; in fact in A.D. 1720 Awadh broke away from the Moghuls, and Lucknow emerged as a great city in the highly productive Awadh Plain. The effective rulership of the Moghuls sometimes hardly extended beyond Delhi or the fort area, while the country-side was under invasions, counter-invasions and loot and plunder of various local and regional powers.

Meanwhile, the British power was progressively marching from the east, and in 1803 the Agra region was ceded to the British. The anarchy and misrule of Awadh Nawabs led to the annexation of the Awadh also by the British in 1856 and the entire area came to be known as the North-Western Provinces of Agra and Oudh together with the Banaras region. Once again the regional powers and the Moghul emperor fought with the British to wrest power in India's 'First War of Independence' (1857-58), but could not succeed. However, the British assessed the strategic value of the region and developed a soft attitude to pacify the people and develop the area economically. The increased transportation and irrigation facilities led to rapid agricultural development. This resulted in the rise and revival of cities, and the rapid progress of Kanpur from a small trade depot to a large industrial giant is an example in point. Early spurt of infrastructural development led to rapid economic growth of the region in contrast to the backward and rather depressed economy of the eastern parts of the State of Uttar Pradesh.¹⁹

The Physical Setting

Geology

An almost imperceptible change in elevation and uniform surface materials are the two noteworthy features in the physiognomy of the region. Like its counterpart, the Middle Ganga Plain in the east, it also forms part of the alluvial filled asymmetrical Indo-Ganga trough with a definite divide formed by the subterranean Delhi Ridge, a protrusion of the Peninsular Block. The pre-Tertiary river-borne debris from the Peninsula, later supplemented rather more vigorously by the Upper and post-Tertiary Himalayan debris, yet to undergo intense compaction, constitute, by and large, the alluvial filling. However, "Alluvium is one continuous and conformable series of fluvial and sub-aerial deposits, mainly composed of unconsolidated beds of clay, sand, gravel, and their mixture in varying proportion".²⁰ Oldham estimated the depth of the alluvium between 4000-6000 m and Burrard considered the existence of a fault with 32 km downthrow near the Himalaya. Later Glennie estimated the thickness at about 2,000 m. The recent findings of the aeromagnetic survey of the Ganga Valley²¹ have thrown much light on the depth of the alluvium and nature of the trough. It rather replaces the hypothesis of the frontal plain by the downwarp. Though the alluvial filling on an average is 1300-1400 m, decreasing gradually southward, a zone of over 8000 m depth runs all along the Himalaya (Fig. 4.2). The extensive pre-existing basins, such as Kathgodam-Lakhimpur basin and Bahraich basin and similar others such as Gorakhpur and Motihari basins falling in the Middle Ganga Plain and connected together with narrow necks, probably between the peninsular projections, have been indicated within the 8000 m depth zone. The westward decrease of the depth is well marked as the small basin lying to the west of the Moradabad-Kathgodam alignment has less than 6000 m depth of the alluvium. The Doab south of Bulandshahr has in general, less than 1500 m alluvial depth. Thus in the south the alluvial cover, gradually thins out to a mere veneer, finally merging with the irregular edge of the

peninsular block. The alluvial depth is, at places, occasioned by less than 3000 m thick cover probably on the detached protrusions of the peninsular block as around Shahjahanpur and is less than 1500 m near Faizabad and Gonda (Middle Ganga Plain). Although nearly half of the Upper and Middle Ganga Plain lying roughly south of the Hapur-Etah-Unnao-Patpargarh-Bhadohi-Ghazipur-Jagdishpur-Hajipur and Purnea alignment has less than 1500 m thick alluvial deposits. The subterranean crustal dislocations, the probable causes of the earthquakes, have also been identified more or less separating the aforesaid basins, notable being Moradabad-

Kathgodam, Balamau-Kheri and Muzaffarpur-East of Buxar.

The constituents of lithology, i. e., the *Khadar*, *Bhangar* and the gravels are but the variants of the alluvium corresponding to their location and subsequent processes involved. The silt, clay and sand particles, renewed annually, occupy the reverain tracts (flood plains) whereas the *Bhangar* occupy the interfluvial zones above the general flood limits, the constituents experiencing slow and secular changes. The gravels of the Tarai and the Bhabar zones are the loosely set sediments, ranging from fine silt or clay particles to coarse sands, pebbles and sometimes even boulders and

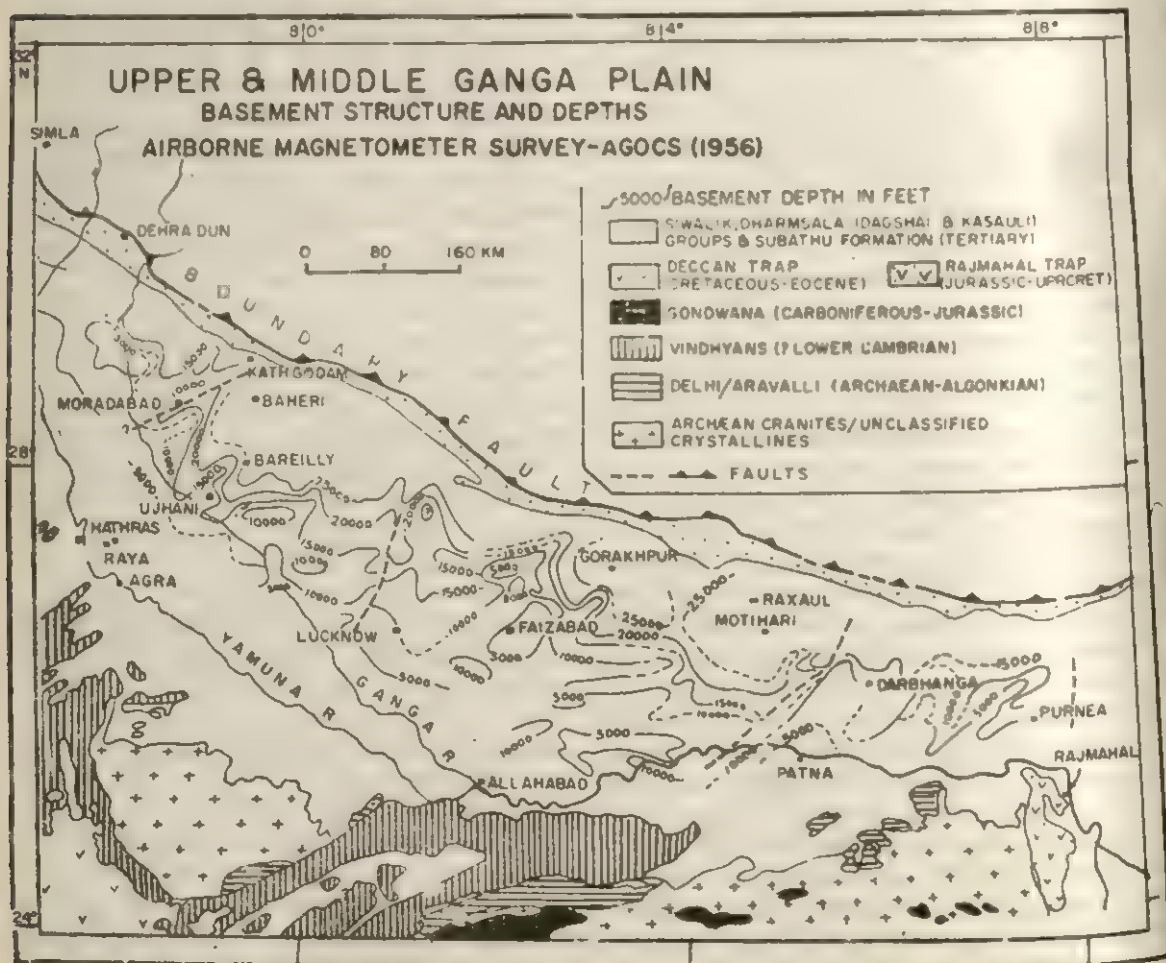


Fig. 4.2

spread haphazardly in the zone of the break-in-slope at the foot of the Siwaliks. One distinctive character of the *bhangar* is the formation of *kankar* pans in the sub-soil zone through capillary action owing to the alternating calcareous sand and clay beds here as also elsewhere in the zone of seasonal rainfall, which adds to soil moisture retention in the subsoil zone.

Physiography

This seemingly featureless plain lacks topographic prominences and the monotony of the physical landscape is broken broadly by the Tarai-Bhabar submontane belt and on micro level by the river bluffs, levees, dead arms of the river channels, the ravines and the river channels themselves (Fig. 4.3, a). The axis of the topographic trough paradoxically lies nearer the peninsular block or along the Ganga which traverses the area in a south-southeasterly direction with an average gradient of about 24 cm per km which, however, is higher (about 100 cm/km) in the upper 140 km of its course and is much lower (about 10 cm) in the remaining part. Thus there is, though not perceptible, a tract adjacent to the foot-hills where the slope is higher and has resulted in the preponderance of numerous small streams, assigning a somewhat medium to fine texture to this part, while the southern counterparts, particularly north of the Ganga, are characterised by the sluggishly-flowing streams like the Ramganga and the Ghaghara studded with ox-bows, sandy stretches (the Bhurs), etc. Even the relative relief is less pronounced here. The Doab, on the contrary, exhibits somewhat more stable *bhangar* lands which sometimes rise 15-60m²² above the adjoining flood plains. Throughout the region there is preponderance of local slopes over the regional slope. The streams such as the Kali, the Hindan, the Pandu, etc., have to go a long way parallel to their master streams to empty themselves. Distinct, though areally insignificant, in topographic expressions is the Yamunapar or the Yamuna-lower Chambal tract. The degradational work of the Chambal and its ephemeral affluents presents deep entrenching of the softer alluvial banks sometimes up to 5 km

away from the main channel, thus resulting in the ravine landscape or a bad land topography, a feature not very uncommon with other streams but hardly comparable in magnitude to this tract. The deep valleys separated by sharp spurs and buttresses are the main features.

Topographically most significant and complex part of the region is the submontane belt, running at the foot of the Siwaliks from west to east across the area on the northern border consisting of the two parallel strips—the piedmont zone, the *Bhabar* (the *Ghar* of the Doab region) and the adjoining relatively gently sloping Tarai belt. The former, about 32 km broad belt, is a zone of unassorted sediments where fans and talus and disappearance of the seasonal torrents traversing the southern scarp of the Siwaliks, are the common features. These parallel torrents cutting the region transversely accelerate soil erosion and render the land unfit for agricultural use by depositing coarser materials. The Tarai, however, is the zone of seepage where fine sand, silt and clay are deposited by the emerging streams. Almost level and fertile soil along with high water table has rendered unique physical and cultural landscape to the belt. Once a marshy and forested tract about 100 km wide, it is shrinking mainly due to the reclamation measures and the deforestation schemes. The *Bhabar* and to some extent the *Tarai* also, form the source region of several streams notable among them being the Sukhata, Deoha and Gomati. The topographic diversities produced by the changing river courses are predominantly observed in the Ramganga and the Ghaghara valleys, particularly in their flood plains.

Thus the micro level topographic facets and their regional characteristics render possible the delineation of as many as four physiographic units i.e. (i) the submontane belt, (ii) the Ganga-Ghaghara Doab region, (iii) the Ganga-Yamuna Doab, and (iv) the Yamunapar in the ravine tract. Within the Ganga-Yamuna Doab the areas north of Bulandshahr and south of Etah consist of silty and clayey *bhangar* tracts while the sand ridges alternated by depressions in the Bulandshahr, Aligarh, etc., render this portion

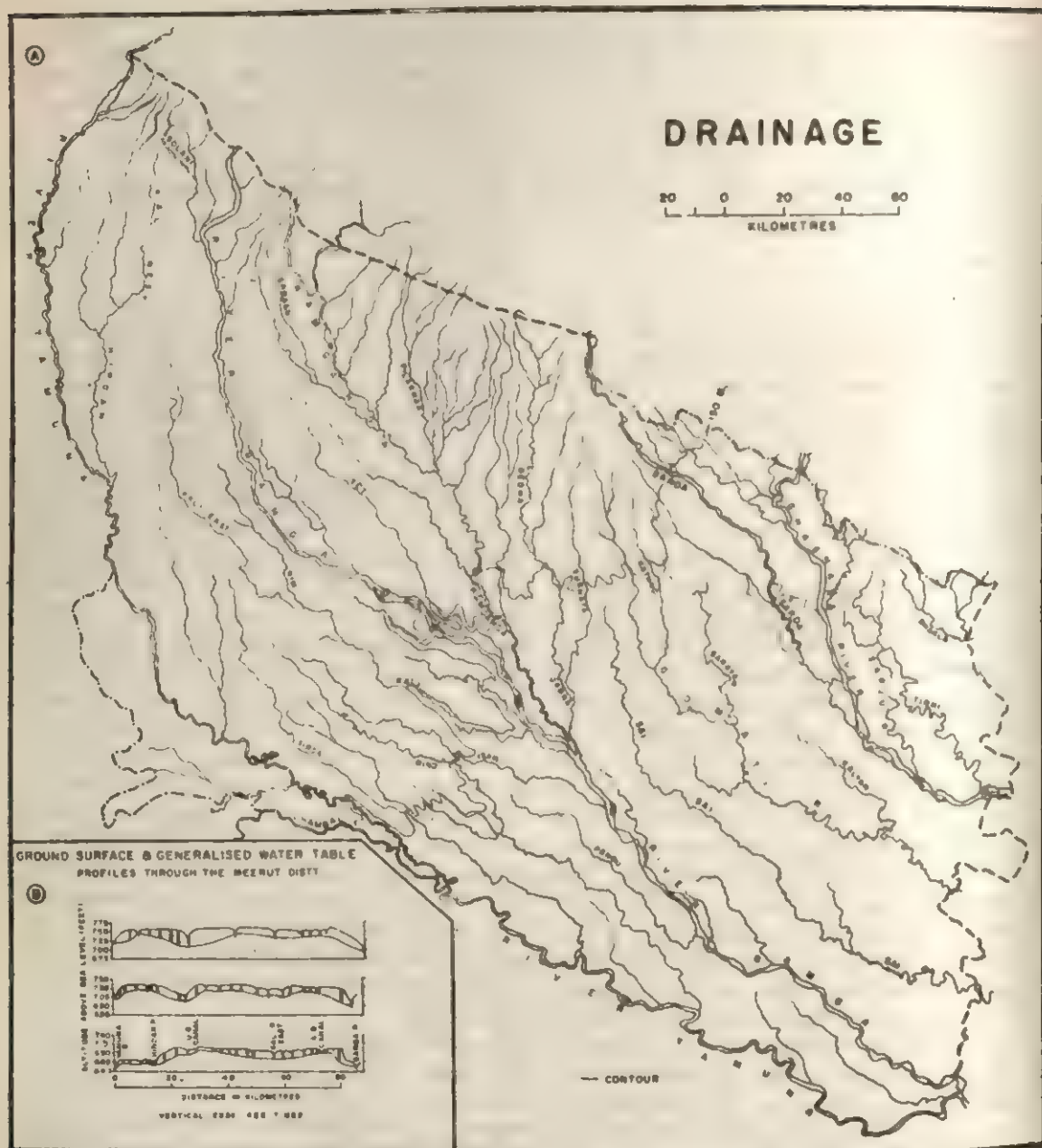


Fig. 4.3

of the Doab topographically more diversified than those of its counterparts in the north and the south. The nature of deposits probably owes to the crescentic bends of the two master streams, the Ganga and the Yamuna. The

lower-order divisions are marked in the form of the flood plains and the interfluvial *bhangar* lands. Locally the levees and the sandy tracts, especially in the Ramganaga and the Ghaghara catchments, stand prominent.

Drainage

The region in general is a part of the well-integrated drainage system of the Ganga although the two important tributaries, the Ghaghara and the Gomati join the master stream in the Middle Ganga Plain. Almost all the streams follow a NW-SE course concomitant with the lie of the land. The extremely gentle gradient almost all over the region restricts the degradational activities of the streams resulting in the near parallel courses and the acute angle junctions of the tributaries with their master streams at most levels; the confluences of the Ganga with the Ramganga and that of the Ramganga with the Ganga are typical examples. This feature imparts the region a pinnate drainage, an extreme case of the dendritic pattern on macro level. Braidings, especially of the Yamuna, the Ganga, the Ramganga and the Ghaghara, the sandy shoals often liable to inundation during monsoons, and the frequent meanderings are also the common features. The minor topographic diversities have led to the spatial variations in the channel frequencies and the textural patterns. A host of seasonal torrents originating from the southern slope of the Siwaliks, notably the Muskara, the Punja, the Solani, the Ratmau, the Pilakhar, etc., drain the northern part of the area while southward the streams are fewer. The Kali, the Sukhata, the Gomati, etc., mark the next zone of the river source in the *Bhabar* and the *Tarai* (Fig. 4.3, a). Most of the streams are perennial with more defined courses. Yet another group of the streams, the Kali East, the Sot, the Sai, the Kalyan, etc., are entirely the plain rivers originating from the depressions or *tals* in the *bhangar* tracts.

The Ganga and its major tributaries, the Yamuna, the Ramganga and the Ghaghara are the only Himalayan rivers which carry sufficient water all the year round, though with high seasonal fluctuations. Wide flood plains and high banks are the common features in the course of the Ganga and the Yamuna along with silt and clay deposits, while the other two have rather ill-defined channels, subject to frequent changes which is a probable consequence of the nature of

deposits and the space available to carry coarser materials.

From the south the Chambal is the only tributary worth mentioning, which is well known for its role in developing the bad land topography. For miles together it runs parallel to the Yamuna, before joining it.

Regionally, most of the Awadh and the Sarayupar Plain is drained by the Ghaghara and the Gomati while the Ramganga collects most of the drainage of the Rohilkhand Plain. The Doab has fewer streams worth the name joining the Ganga and the Yamuna.

Climate

It is a sub-humid region between the dry Punjab Plain and the humid Middle Ganga Plain, within the vast monsoonal regime of the Great Plains and naturally partakes the characteristics of the two adjoining regions. With comparatively greater incidence of winter rain, the region distinguishes itself from the Middle Ganga Plain. Micro level diversities are no doubt introduced by the proximity of the Himalaya.

The average weather conditions emerging out of the combined effect of the various elements lead to the recognition of four well marked seasons, i.e., the Hot Summer, the Wet Summer, the pre-Winter transition and the Winter. The gradual rise in temperature which starts from February, becomes more rapid increasing by 5°C by March and continues till May/June (maximum temperature over 40°C) unless checked by the incursion of the more humid easterlies, though the precipitation does not materialise by this time. The scorching effects of *loo* (the hot and dry westerlies) are aggravated due to the lower relative humidity (below 40%). The Himalaya undoubtedly exert influence as the maximum May temperatures remain well below 40°C at Gonda, Bareilly and Meerut, whereas it crosses that limit in the southern part i.e., at Allahabad, Kanpur and Agra (Fig. 4.4). The premonsoon (March-May) showers are meagre (below 5 cm.) and the share in the average annual rainfall ranges between about 1% at Bareilly to almost 5% at Bahraich. Thus the low RH and meagre rain-

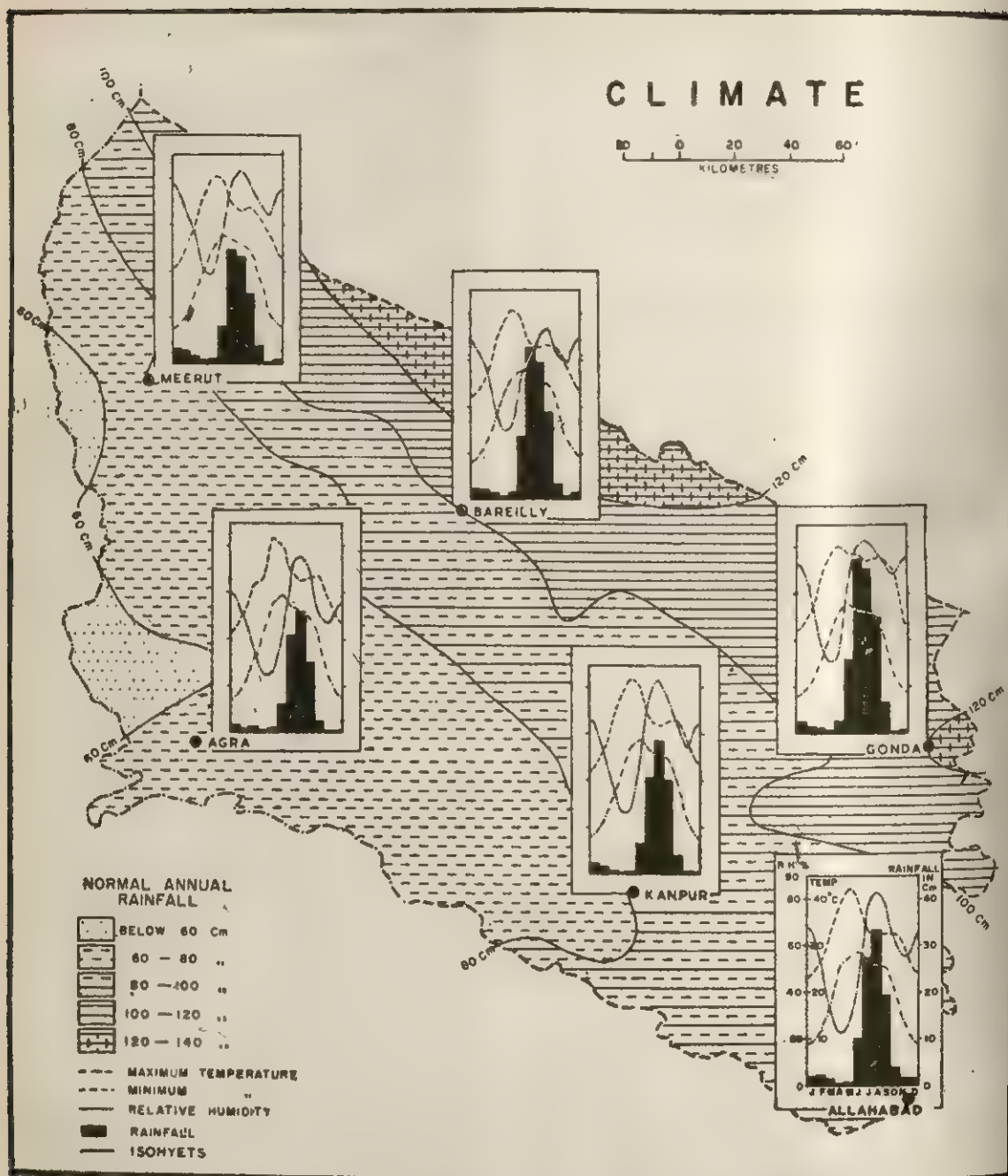


Fig. 4.4

fall accentuate the impact of 'loo' which at times is associated with heat waves when temperatures shoot up to exceptionally high figures (48.3°C at Agra on 2nd June, 1889; 49.9°C at Gonda on May 8, 1958).

The rainy season commences in the later half of June at different dates which are too uncertain to be predicted. It brings relief to the people by lowering down the temperatures gradually which range between 30° and 40°C during June-October. The relative humidity remains over 70% throughout the rainy season, except for June when it averages below 50%. The rainy months account for over 90% of the total annual rainfall. The monsoon rainfall as also the annual rainfall decreases westward as well as southward (Gonda 113 cm, Bahraich about 100 cm, Saharanpur 75 cm, Allahabad 90 cm and Agra 68 cm). The season occasionally assumes sultry condition which is more confined to the northern and eastern sections. There is dominance of Bay currents. Occasionally the dying Bay depressions are revitalised by the Arabian Sea currents in the western part of the region. The agricultural activities are much dependent on the onset, withdrawal, breaks and the nature of the downpours. The late withdrawal hampers the timely sowing of the *rabi* crops while the late start, the sowing of the *kharif*.

The season comes to an end by October with a sudden fall in temperature (over 4°C) and amount of rainfall. Rainfall does not exceed 10 cm in October throughout the region. The two transitional months (October-November) are characterised by the second minima of RH, somewhat unstable atmospheric conditions and often fair weather. Soon after the winter conditions settle in, which are marked by further fall in temperature and prevalence of dry and chilly westerlies occasioned by the western depressions associated with welcome rain and the cold waves and registering temperatures below freezing at places (Agra -2.2°C on 16th January, 1935, Roorkee -2.2°C on 2nd February, 1905). The average temperature is lowest in January (below 20°C) which spatially decreases west and northward (Allahabad 16.8°C, Gonda 15.6°C, Agra 14.8°C and Meerut 14.2°C). The incidence of winter

rains in the region is relatively more than the Middle Ganga Plain (3.4%) but less than the Punjab Plains (11.9%) as it receives about 5% of the total annual precipitation. Even this meagre rainfall, associated with the dampness of atmosphere (R. H. 55%—75%) and lower potential evapotranspiration due to the low temperature, becomes more effective and beneficial to the *rabi* crops.

The average annual rainfall varies between 50 cm and 140 cm with an uneven spatial distribution. The Doab, west of Kanpur except the north-eastern part experiences less than 80 cm rain whereas a sub-zone comprising the Yamunapar Plain and the central fringe around Delhi is relatively dry (less than 60 cm), while the submontane belt and the adjoining southern tract together, lying in the districts of Gonda, Bahraich, Kheri, Bareilly, Nainital, Bijnor and Saharanpur receive over 100 cm rainfall. The characteristic features are the westward and southward decline in the total rainfall and the incidence of double maxima (January-February and July-August) though not comparable in magnitudes (Fig. 4.4). The variability of rainfall is inverse to the amount as Allahabad, Lucknow and Delhi represent respectively 28, 30.3 and 33.3% coefficients of variability. Occasional exceptionally high daily, monthly and annual precipitations are also worth noting as sometimes a good proportion of the total annual rain is received within a single month (Bahraich in August, 1938 recorded 97.1 cm, i.e., over 85% of its total annual precipitation). Sometimes within 24 hours more than 30 cm (Lucknow 31.1 cm on 17th July, 1947) are recorded.

Soils

In this region of almost uniform topography and lithology, the soils are by and large, homogeneous. The alluvial soils with the variants, the *Usar* and *Bhnr*, depending on the drainage conditions, mechanical and chemical constituents and the climatic characteristics are observed in different parts. In addition, there are minor variations in certain properties. The two common types—the *khadar* and *bhangar* with different local names, which sometimes stand for minute variations in properties, are quite widespread.

The *khadar* soils, relatively rich in plant nutrients, occupy the narrow frequent siltation tracts in the flood plains of the rivers. Neutral to alkaline in reaction (pH 6-8), these are deficient in organic materials specially phosphorous, and are sandy to loamy in texture. Locally, as observed by Agarwal and Mehrotra,²³ the Ganga *khadar* soils have immature profiles with sandy to silty loam texture, lack of concretion, fair proportion of lime and other soluble salts and are alkaline in reaction (pH 8) with imperfect drainage, while the Yamuna *khadar* soils have sub-mature profile with predominance of clay and concretion and very high lime and other soluble salt contents under the poor drainage condition. Even the Yamunapar *khadar* also differs, having mature profile, average lime content, loamy texture, neutral reaction (pH 6.8-7.2) under the restricted drainage conditions. Fertility is revived owing to frequent siltation.

The *bhangar* soils are more extensive in areal spread, occupying the interfluvial zones. Relative consistency in the factors responsible for the soil development has provided it a somewhat mature profile with varying colours. In general the soluble salts and lime are low and show neutral to slightly acidic reaction except pH 6-7.5 in the lowlying areas prone to water-logging. Illuviation is a common characteristic everywhere. In the proximity of the Ganga these are loamy to sandy loam in texture while near the Yamuna the silt content decreases giving sandy to sandy loam texture possibly due to the excessive drainage.

Among the variants worth nothing are the *usar* (*reb*) soil in a sizeable tract in the Ganga-Ghaghara Doab from Sultanpur, Pratapgarh, through Rae Bareilly, Lucknow, Hardoi, Shahjahanpur, etc., contiguous with the tract of the Middle Ganga Plain, caused by the efflorescence of sodium carbonate and sulphate under the alternating rainy and dry season, higher water table and alkaline composition. The canal irrigation is also aggravating the *kallar* problem. Locally the reaction varies depending on the sodium and calcium content as in the humid climatic conditions of Pratapgarh the predominance of sodium provides the *usar* soil a neutral to acidic

character whereas in Lucknow tract additional materials, the calcium, makes it highly alkaline.

Another variant, the *bhar*, the sandy river deposit, is highly localised in Ramganga tract and in the narrow belt along the Ganga. The soil is more sandy in texture and workable economically only with irrigation.

Slightly different from the *khadar* and the *bhangar* is the submontane soil where two physiographic units, the *bhabar* and the *tarai*, are bedded with texturally different soils. The *bhabar* soil is sandy to gravelly, highly porous and aerated, and has lower moisture-retaining capacity, while the *tarai* zone is provided with rich clayey soil, with some proportion of fine sand, moisture and rich humus. The two zones are thickly forested. The deforestation in the *tarai* is bringing considerable changes in the soil texture, humus content, etc.

Natural Vegetation

Originally the Upper Ganga Plain was covered with thick forest. 'Bansudha', the forested area in the Ghaghara-Gomati doab, 'Namisaranya', famous forest in the area now in Sitapur district, the hermitage of sage Valmiki on the bank of the Ganga in the area now a part of the Unnao district, the *Khandaw* of the Mahabharata and other such fragmentary references throw sufficient light on the predominance of natural forest vegetation in the past. During about three millennia of human occupation in the region gradual clearing of the natural vegetation for cultivation has continued. Today there exist a few small patches of woodland in the plains; but are more extensive in the submontane belt comprising 4.5% of the total area of the region (14,422 km²) a figure far below the state average (12.8%) and optimal share (33%). The present per capita forest area (0.001 hectare) in the region is bound to go down if the *tarai* belt is excluded. Even this meagre acreage is quite unevenly distributed. The percentage of forest area by district is rather higher in the *Tarai* districts (Lakhimpur 27.5, Pilibhit 30.7, Saharanpur, Bijnor and Bahraich each over 13%). In the plains it varies from 0.1% (Pratapgarh) to 3.0% (Meerut). Even the

existing forest covers in the plain are of poor quality and are considered to be uneconomic.

The forests can be grouped as tropical moist deciduous, tropical wet and sub-tropical dry. Tropical moist deciduous forests are confined to the Tarai areas. The available species of the tarai forest is sal, but is poorer in quality as compared to the bhabar sal. The second group of the forests is a little more open and mixed with *semal*. The tarai is also known for tall grasses, like the elephant grass, *kans*, *munj*, etc. In sub-tropical dry area, especially in the western part, *Shisham*, *babul*, *khair* and *semal* are the main species seldom occurring in larger patches.

Ground Water

The region is potentially quite rich in ground water resource, both free and confined. There are few studies carried out mostly by the irrigation department. The confined aquifer (permanent water table) generally strikes between 60-90 m depth, while the temporary water table (free aquifer) depth is less than 30 m with wide spatial and seasonal variations. The information regarding the general occurrences is quite inadequate to explain the actual conditions. The free aquifer bears significant relationship with the relief, geological structure and existing water channels, as riverain *khadar* tracts show, in general, lower water table which probably owes to seepage, while the heavy clay belts of the *bhangar* have higher water table. The canals, however, are the exceptions which add considerably in bringing the water table higher up as also in the Punjab Plain. A work in this field by a student of Geography is that of R. N. Mathur²¹ in the Meerut district, where about 20% of the observation wells show less than 3.3 m depth of the water table and over 70% between 3.3-10 m, the zones of high and low water table are highly localised as most of the first category wells are in the vicinity of the canals and those with lower water table are near the rivers, the Ganga, the Yamuna and the Hindan (Fig. 4.3 b). Seasonal variations are well marked as also in the other parts.

Physical Resource Base

The total physical resource base in the region is confined to its rich alluvial soil and abunda-

nce of water resources in its long perennial rivers. The two together can serve as the best ingredients for better development of agriculture. Relatively lesser instances of floods as compared to its counterpart, the Middle Ganga Plain, and more assured water supply even at present through the canals account for its agricultural prosperity. It may be strengthened through further laying of more canal distributaries and providing irrigation facilities to so far unirrigated lands. The hydel power generated from the waters of the rivers will go a long way in further rural electrification and will provide subsidiary occupations to the villagers, by way of the development of agro-based cottage industries.

Further, the forest resources of the *tarai* and the *bhabhar* can be used to develop forest-based industries on a large as well as small scale. In spite of the existing paper mill at Saharanpur, a few more can well be set up as cheap hydel power becomes available. Sport goods, furniture, toys etc., industries in Saharanpur, Barilly, Allahabad, can be strengthened and new centres at Moradabad, Bijnor, Meerut etc., can be developed.

There are no mineral resources other than glass sands and lime concretions. In addition, the region has ample ground water resource which await survey and investigation. The Oil and Natural Gas Commission is investigating oil resources in the *tarai*.

The Cultural Setting

Population

With a population of about 45 million over an area of 150 thousand km² the Upper Ganga Plain is one of the most densely populated (density 300 persons per km²) parts of India. The large population and its spatial distribution, density and occupational structure reveal that here man has been not only the creator of cultural landscape but also a basic constituent of the ecosystem of the region. The regional distribution of population and its growth have been mainly related to the agricultural economy and public health conditions in the various parts of the region. The growth rate and density of population have been generally higher in *bhangar* tracts of compara-

tively greater agricultural prosperity. In the *khadar* and *bhur* tracts which are agriculturally less suitable, the growth and density have been rather low. This relation of population and agriculture was more pronounced in the earlier decades. Later, factors of health and urbanization as well assumed greater significance and influenced the distribution and density of population. This brought some modification in the growth, distribution, density and structure of population.

Growth of Population : The population of the region has shown an overall growth of 47.3% while the State average is 51.7% (1901-1961). There has been relatively greater increase in the Eastern U. P. which has raised the State average. The highest overall growth (over 80%) during the period has taken place in Kanpur district due to rapid increase of urban population. The

Doab as a whole, is the area of high overall growth (50-80%) excepting the South-eastern districts of Etawah, Farrukhabad, Mainpuri and Aligarh which show medium overall growth (35-50%). Bijnor, Moradabad and Naini Tal districts of Rohilkhand Plain, Lucknow district of Awadh and Agra of the Yamunapar Plain also record this pattern of high growth, mostly due to urbanization. Medium overall growth of population has taken place over a considerable area of the region forming its central block excepting two encroachments one of the low growth (below 35%) comprising Shahjahanpur and Pilibhit, and the other of high growth (50-80%) in Etah district. There is a significant block of low growth in southern Awadh Plain excepting Lucknow and Pratapgarh districts. The low growth of Rampur district appears to be exception in an area of relatively higher growth.

TABLE 1
Variation of Population (%) 1901-1961

Region*	(1901-61)	(1901-11)	(1911-21)	(1921-31)	(1931-41)	(1941-51)	(1951-61)
Upper Ganga Plain	47.3	-1.94	-5.52	5.88	13.21	11.47	18.35
Moradabad	49.3	3.0	-9.2	7.5	8.8	11.6	22.0
Hardoi-Lakhimpur	39.8	1.5	-4.1	4.8	9.7	6.6	15.5
Bareilly	40.6	3.1	-10.4	3.8	9.6	7.1	16.0
Lucknow	34.7	-4.4	-5.3	4.8	11.5	12.0	13.2
Bahraich	65.3	-0.1	3.0	6.8	9.1	8.8	11.1
Saharanpur	59.7	-6.7	-2.3	12.1	15.5	15.1	13.8
Meerut	65.4	-1.3	-2.7	6.8	17.5	17.1	17.5
Aligarh	46.6	-2.5	-6.6	4.7	16.0	13.5	16.5
Mathura	39.6	-13.9	-5.7	7.6	20.8	12.4	17.4
Agra	75.7	-3.3	-9.5	13.4	23.0	16.5	24.1
Kanpur	59.8	-5.2	-2.6	6.7	18.5	16.2	21.0
Allahabad	60.1	-1.4	-3.9	5.9	19.3	12.5	18.6

*For corresponding reference to regions refer to portions relating to regionalization.

For the detailed appraisal of this overall growth an examination of the intercensal growth is essential.²⁵ (Table No. 1 and Fig. 4.5). It is obvious that the 1901-21 period witnessed decline in almost all the regions excepting Moradabad, Bareilly and Hardoi-Lakhimpur which have shown some increase during 1901-11 and Bahraich Plain during 1911-21. There is then

a continuous increase up to 1941 followed by a retarded growth up to 1951 (11.47) as also in the State as a whole (11.8).

However, since 1921 accelerated growth has taken place only in two regions—Moradabad and Lucknow. There are certain regions where maximum growth has occurred during 1931-41 as compared to other censal decades, i.e., Ma-

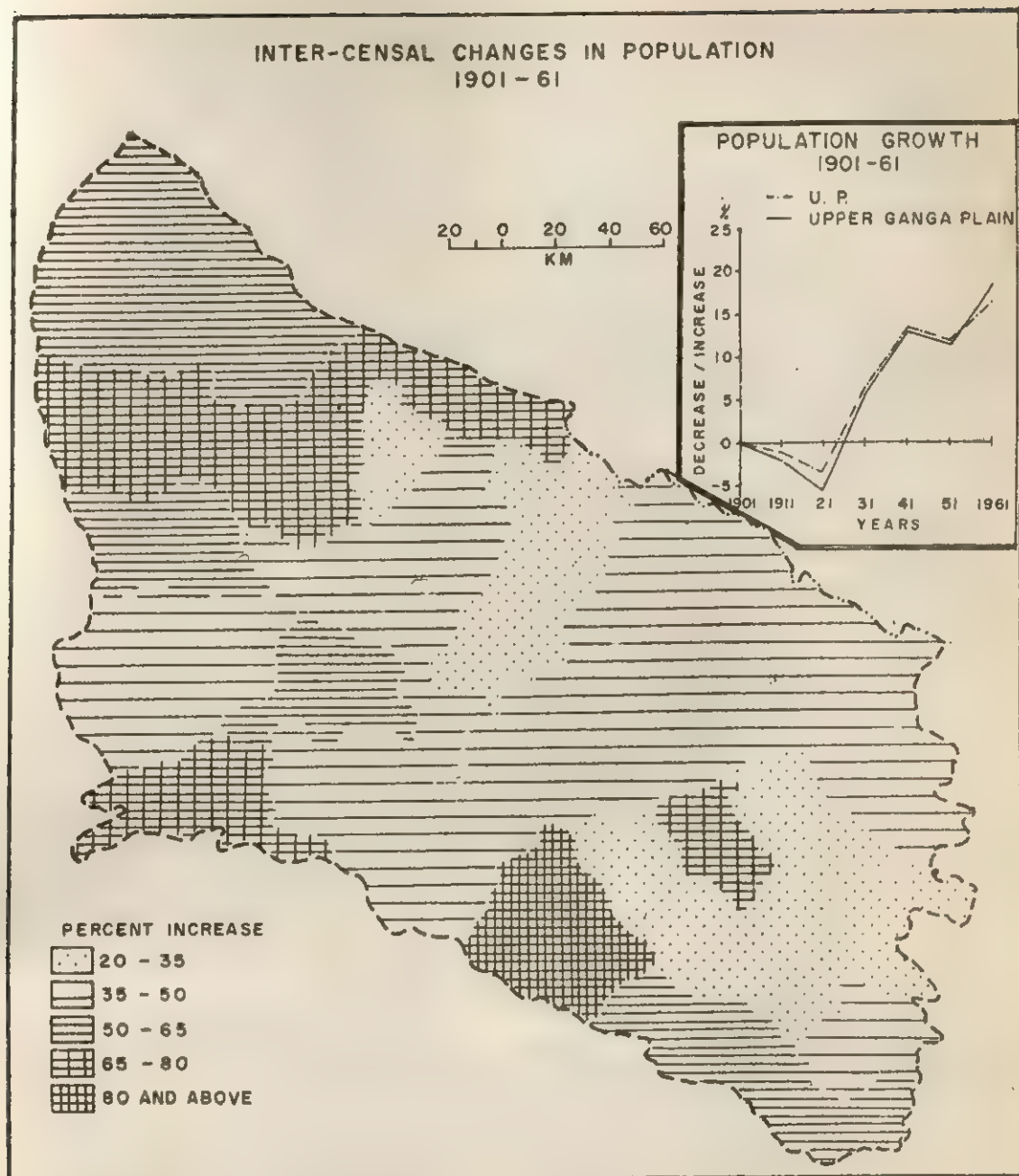


Fig. 4.5

thura (20.8%), Saharanpur (15.5%) and Allahabad (19.3%). It may also be noted that the po-

pulation growth in Meerut has remained more or less static since 1931.

The highest increase (18.35%) took place during 1951-61. It was slightly above the State average of 16.66%, but less than in the country as a whole (21.5). The increased rate of growth was due to continued improvement in medical and health services, resulting in greater longevity and decreased mortality plus the gradual influx of displaced persons during post-independence period. The highest percentage increase (20-30%) in population has taken place in the upper Ramganga Basin and Yamunapar Plain. In the tarai areas, clearance of jungles, adoption of anti-malarial measures, draining of marshy lands and subsequent reclamation of vast areas and their colonization have together resulted in the spectacular growth of population.

Density of Population : In the Ganga Plain the density of population decreases from east to west and as such the overall density of Upper Ganga Plain (300) is less than the Middle Ganga Plain (384) and the Lower Ganga Plain (413). Regionally the density is low in the marginal areas, the tarai in the north and the Yamunapar Plain (below 251) save exceptional areas like Agra (above 500) largely inflated by urban concentration (Fig. 4.6). A ribbon of low density (below 250) corresponds roughly with the *bhar* tracts of the Ganga and the Ramganga and the *bhangar* land of Central Doab excepting Kanpur and Firozabad tahsils (above 500) and Etawah (251-375) again mainly due to urban concentration. The lowest density (below 75) occurs in Puranpur in Awadh Tarai.

Exceptionally high density (above 500) occurs in the tahsils of Chail (Allahabad), Kanpur, Firozabad and Meerut in the Doab, Agra of the Yamunapar Plain, Moradabad, Rampur and Bareilly of Rohilkhand and Lucknow of Awadh. Areas of high density (376-500) occur in Hathras, Aligarh, Bulandshahr, Hapur, Ghaziabad, Baghpat, Budhana and Sardhana tahsils of the Upper Doab, Bilari of Rohilkhand and Soraon and Bela of Awadh bordering the Middle Ganga Plain. Medium density (251-375) is found in significant blocks in southern developing part of the tarai. The largest block lies in the Ganga-Ghaghara Doab of Awadh, the only exception being Luck-

now tahsil which has the highest density (over 450). The second largest block occurs in the Central Doab. The continuity is broken by the low density of Jastrana and Kathar tahsils, and further continues into the northern tract of the Upper Doab and the western Rohilkhand. This continuity with the central block is broken by low density ribbon in the *bhar* tract. A small area also occurs in the Yamunapar tract formed by Mathura and Kairolī tahsils.

While examining the rural density pattern it may be noted that there are certain areas of high density (above 375), such as Baghpat, Sardhana, and Meerut tahsils of Meerut district and Budhana of Muzaffarnagar district being largely dependent on improved agricultural economy and small scale industries. Soraon tahsil of Allahabad also comes in this category.

Movement of Population : During the past decades the migration of the rural people to the urban areas within the region or outside, to industrial areas of Bombay, Calcutta, Kanpur, etc., has been fairly significant. Districts of Kanpur (22%) and Lucknow (24.1%) seem to have attracted more immigrants where large cities have exerted a pull over their respective umlands. Certain amount of population change is also due to social and religious factors. Seasonal movements of population are very significant in the region. During the summer season hundreds of well-to-do people move to the cooler hilly places. During the sugar-cane harvesting months from December to March some labour moves to the sugar factories of the State. Tarai tract has attracted a large number of settlers during the last two decades.

The sex ratio of the region varies from 800 to 900 barring some local exceptions, as for instance, tahsil Milak (Rampur district) and Jalalabad (Shahajahanpur district) have 1,047 and 791 respectively. A relatively more balanced (900 to 1,000) sex ratio is particularly marked in the eastern part of the plain covering the districts of Rae Bareilly, Fatehpur and Allahabad. The sex ratio of urban areas (a little over 800) is lower than that of rural areas (over 900). In the industrial city of Kanpur the sex ratio is as low as 739.

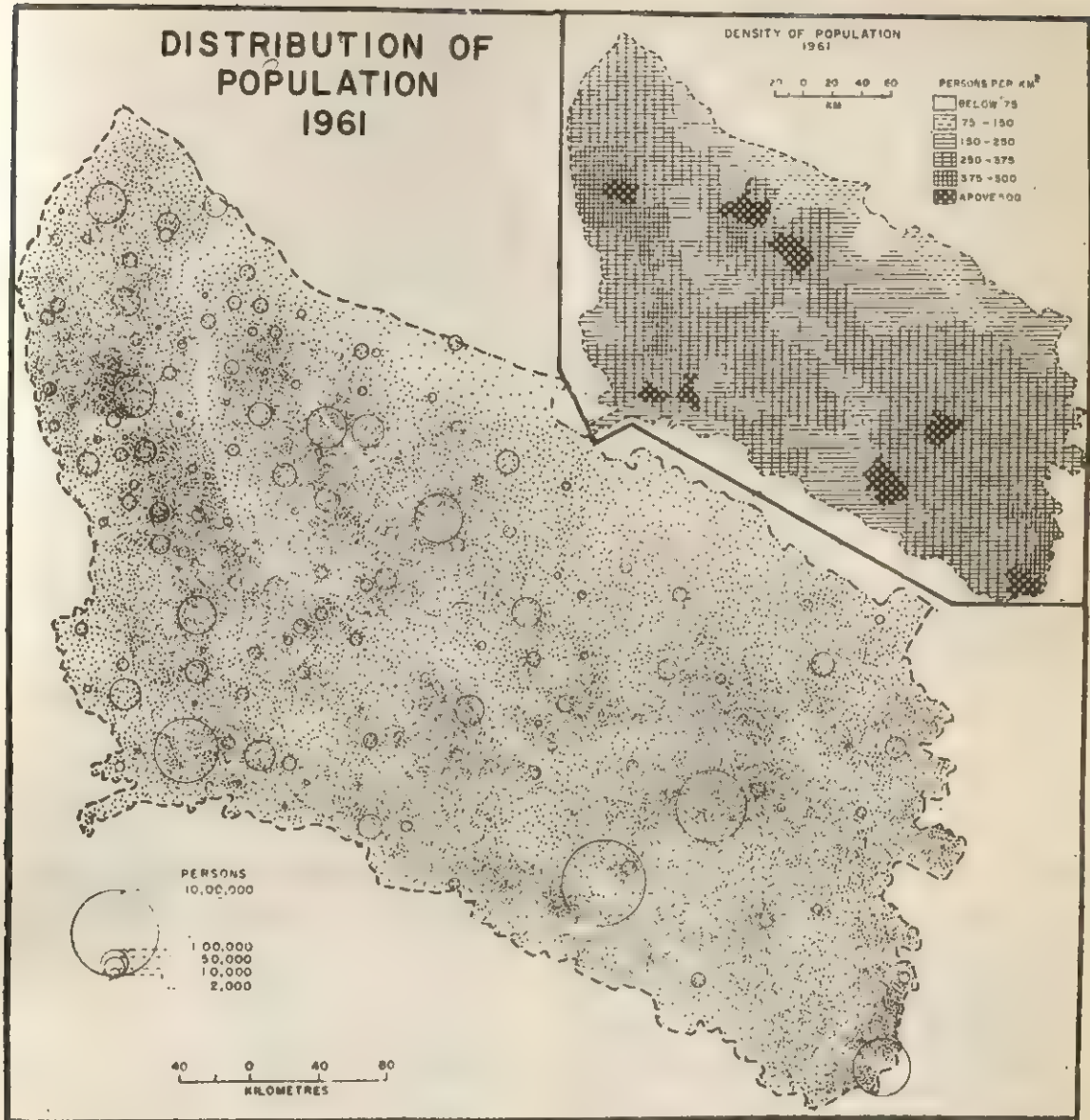


Fig. 4.6

Literacy rate of the region is about 18.47% of which the proportion of female is about one-fifth. Some of the tahsils of the region, where some towns are located, have literacy over 30%. These are Kanpur (42%), Lucknow (38), Chail (36), Agra (33), Haldwani (33) and Meerut (32).

About three-fifths of the tahsils of the lower Doab have literacy rate above the State average (17.6%). Other tahsils of the region have 24% literacy on an average. However, all tahsils of the *tarai* east of Moradabad, have very small proportion of literates.

There are about 16.5 million total workers in this region which constitute 36.5% of the total population. The share of the female workers is only 10% of the total which is less than half of the State figure (22.07%). As the region is predominantly agricultural, 69.5% (including 8.26% agricultural labourers) of its total workers are engaged in this activity. Next, the other services category which includes various service classes such as administration and education etc., employs 11.5% of the total workers. The share of industrial workers is about 10.15%, but about three-fifths of this come under household industries. In trade and commerce (4.5%), transport and communication (3.02) and construction (0.85) employment is relatively low. Due to the absence of minerals, only 0.55% of the workers find employment in mining activity.

Rural Settlement

Though it has a relatively much higher proportion of urban population than the Middle Ganga Plain, the region, as a whole, is predominantly rural with 36,752,829 persons or 81.5% of the total population, living in 52,039 villages

of varying sizes. An examination of Table 2^a reveals that most of the population (55.1%) of the region lives in medium size villages (500-2,000), and the proportion of the population living in overgrown villages (above 5,000) is also considerable (7.1%). However, regional variations are quite wide and significant. In Rohilkhand Tarai the percentage of population living in small size villages is highest (40.9%) followed by Rohilkhand West (28.9%) and East (28.4%). The percentage of population in large size villages (2,000-5,000) is highest in Meerut region (33.6%), followed by Mathura (32.5%), Agra (31.8%) and Saharanpur (28%) regions; it is evident that the Upper Doab and Yamunapar Plain regions are notable for large size villages. Even the percent of population living in overgrown villages is higher in the Upper Doab as a whole, while in the Yamunapar tract Mathura region also records the same. High medium size villages (1000-2,000) account for 30% in the Doab as a whole. It is remarkable that a vast majority of the population of Bahraich region (68.6%) lives in medium size villages. The rest (16.3%) resides in small villages.

TABLE 2
Percentage of population living in villages by population size
(1961)

Region	Less than 500	500-1,000	1,000-2,000	2,000-5,000	More than 5,000
Rohilkhand Tarai	40.9	29.8	17.0	10.2	1.9
Rohilkhand West	28.9	33.0	21.0	9.5	6.6
Rohilkhand East	27.4	35.3	24.0	10.6	2.9
Awadh North	19.0	29.5	33.4	15.5	2.5
Awadh South	23.6	30.8	28.1	16.0	1.9
Bahraich	16.3	34.2	34.4	12.6	2.4
Saharanpur	10.1	21.6	30.4	28.0	9.6
Meerut	6.4	18.9	33.6	33.6	7.4
Mathura	9.3	20.6	28.8	32.5	8.8
Agra	9.9	23.5	30.8	31.8	4.0
Aligarh	15.6	27.2	31.5	21.9	3.7
Kanpur	18.8	29.6	29.8	19.9	2.8
Allahabad	21.6	28.8	27.3	18.9	3.0
Upper Ganga Plain	18.5	27.1	28.0	19.2	7.2

As compared to the previous decades, the remarkable feature of the growth of the rural population in this region is that the percentage of population living in small size village (population below 500) has decreased very much. The villages of this size suffered a heavy loss in all the districts of the region and now account for 18.5% of the rural total. The low-medium size villages (500-1,000 pop.) have also experienced this trend, decreasing from 31.1% during 1901 to 27.1% in 1961. The medium and high medium size villages (1,000-5,000), on the other hand, have most notable gains, the percentage being 23.7% in 1961 from 17.1% in 1901. This trend towards greater nucleation of rural settlement has been almost universal in the Upper Doab. Among the large size villages there has been an increase in the percentage of rural population from 1.8% in 1901 to 7.2% in 1961. The maximum increase registered in the villages of this class was most probably due to declassification of a number of towns to village status in 1961.

Distributional Pattern : The distributional pattern of rural settlements and their types in the region are intimately related to its dominantly alluvial morphology and the predominantly agrarian economy. The nature of terrain, type of soils, facilities of water supply and means of transport have also important role in the development of settlements. In the Ganga-Yamuna Doab, high fertility of soil, more *bhangar* lands, adequate irrigational facilities, and well developed means of transport have given rise to almost uniform distribution of settlements. In *tarai* area of Rohilkhand-Awadh region, the settlements are, however, unevenly distributed due to high percentage of forests, marshy tracts and seasonal floods, and the villages are located on relatively higher ground. In general, the unpopulated villages are a pronounced feature of the *tarai* tract due to frequent desertion of sites owing to floods and other causes and the migratory cultivation by the aboriginal tribes. On account of overflowing and changes in the river courses, villages are mostly hamleted and are often located at the points of geographical advantage, such as embankment and river bluffs,

etc. In the Rohilkhand and Awadh, villages are generally evenly distributed and are located above the flood level. In the Yamunapar tract, where the land is often broken, the distributional pattern of villages is governed by the availability of the level nature of the plain. The large ravine tracts are almost devoid of any settlement.

In the *Ghar* region of Saharanpur, the settlement sites generally follow the drainage lines and the nature and degree of slope.³⁷ In the western part where some favourable conditions are available, as many as three settlements have grown within an area of less than 1 km² and they are separated only by a very thin boundary consisting either of agricultural field or of groves and other similar features. On the whole, the density of rural settlement is only 0.26 per km.² Compact type of settlements are widely distributed and are most dominant in the *Ghar* (52.9% of the total settled sites). Such settlements are common in the south-western level plains and southernmost part of the *Ghar* (Fig. 4.7). The semi-compact settlements which comprise 27.8% of total sites, are new additions due to jungle grants or extension of agriculture. Newly built roads have also contributed to the growth of these hamlets. Besides these, the linear settlements along the Burhi Jamuna and circular pattern of settlement in the Solani-Ratmau divide are noticeable.

In the Rohilkhand region, the villages are larger in the *bhangar* lands. In general, every large village has small hamlets, situated at a distance of hardly a few hundred metres. They are usually named after the main village, but with the addition of words like *Mundia*, *Muafi* etc.; such names as Alirazapur Muafi and Sherpur Muafi (Tah. Bilari of Moradabad) remind of the fact that certain estates of the loyal land-lords were revenue-free holdings. These small-sized satellite sites have usually been inhabited by the tenants and agricultural labourers who belong, in most cases, to the lower castes. The uplands are closely packed with village sites; the inter-village distance being a km or two. It is largely due to the rich soil of the region. The settlements of this area are mainly compact.

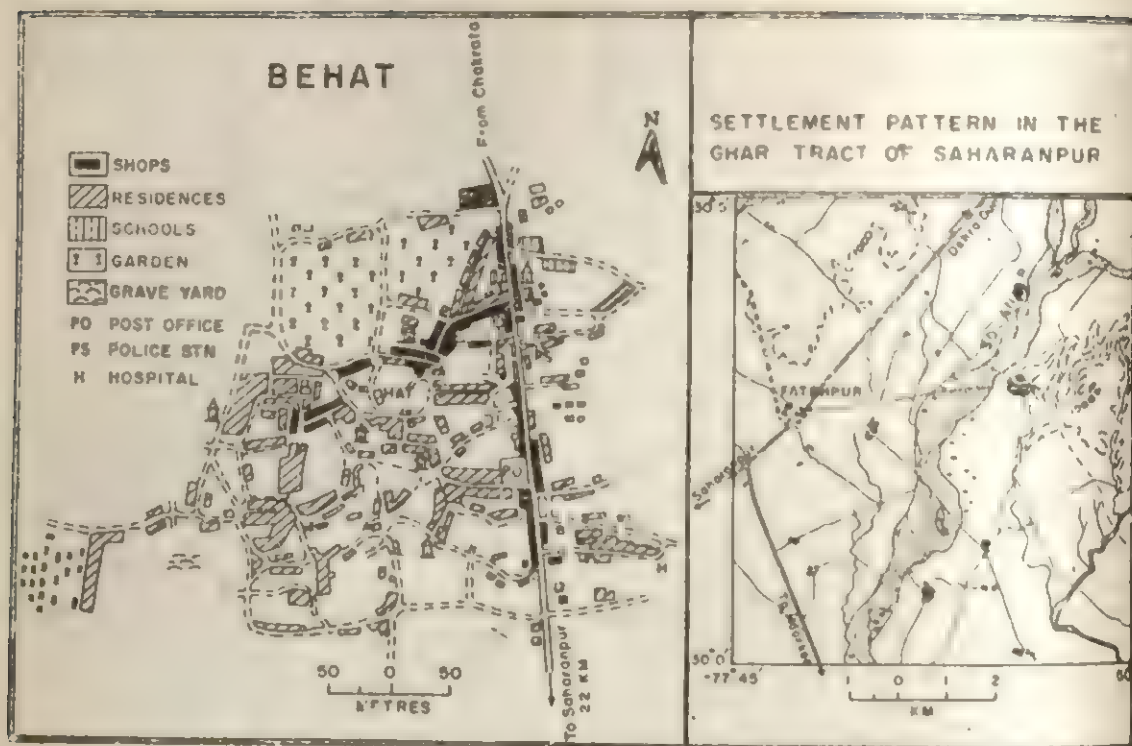


Fig. 4.7 : Morphology of Behat, a representative village of Ghar Tract.

The average inter-village distance of about 2 km²⁶ in the region on the whole indicates the closely spaced location of the villages. With some local irregularities, this close spacing generally decreases from north to south ranging from nearly 3 km in the Nighasan tahsil (Kheri) to about 1.3 km in Dalmau tahsil (Rae Bareilly).

The villages of the Awadh Plain are generally small,²⁹ as 50.3% villages (below 500 population) accommodate only 20% of the rural population. However, Lucknow and Hardoi are exceptions with 46.5 and 40.3% of small sized villages. 58% of the total rural population of the region lives in the medium size villages (500-2,000). Because of the favourable combination of level topography, fertile soil and sufficient water supply in the interfluvial uplands, rural dwellings are collectively grouped into large compact villages. The largest continuous stretch of such villages lies in the Ghaghra-Gomati interfluvial upland from the tahsils of Kheri

through Sitapur, Biswan and eastern part of Sidhauri, Fatehpur and Ramsanchighat, extending to Hasanganj in the Ganga-Sai interfluvial.

The greater part of the Awadh Plain is occupied by semi-compact type of villages. The hamlets are mostly younger than the main village. The study of place names makes it clear that the majority of these hamlets in the region have their names containing the words 'Khera', 'Pur', 'Pura', or 'Purwa' as prefix or suffix. Generally these hamlets bear the name of the founder such as Bhima Khera, Pura Bhola Ahir, Mohan Purwa. Some hamlets are named after some caste such as Purwa Gaderi, Pasi Kheri, etc. In such type of rural settlement, the revenue village is named after the main village, and the hamlets are mainly the dwelling places of the labourers and service classes, and depend upon the village for their needs.

In the long-settled land of the Awadh Plain, the grouping of rural dwellings in the form of small hamlets is a rare feature. However, such

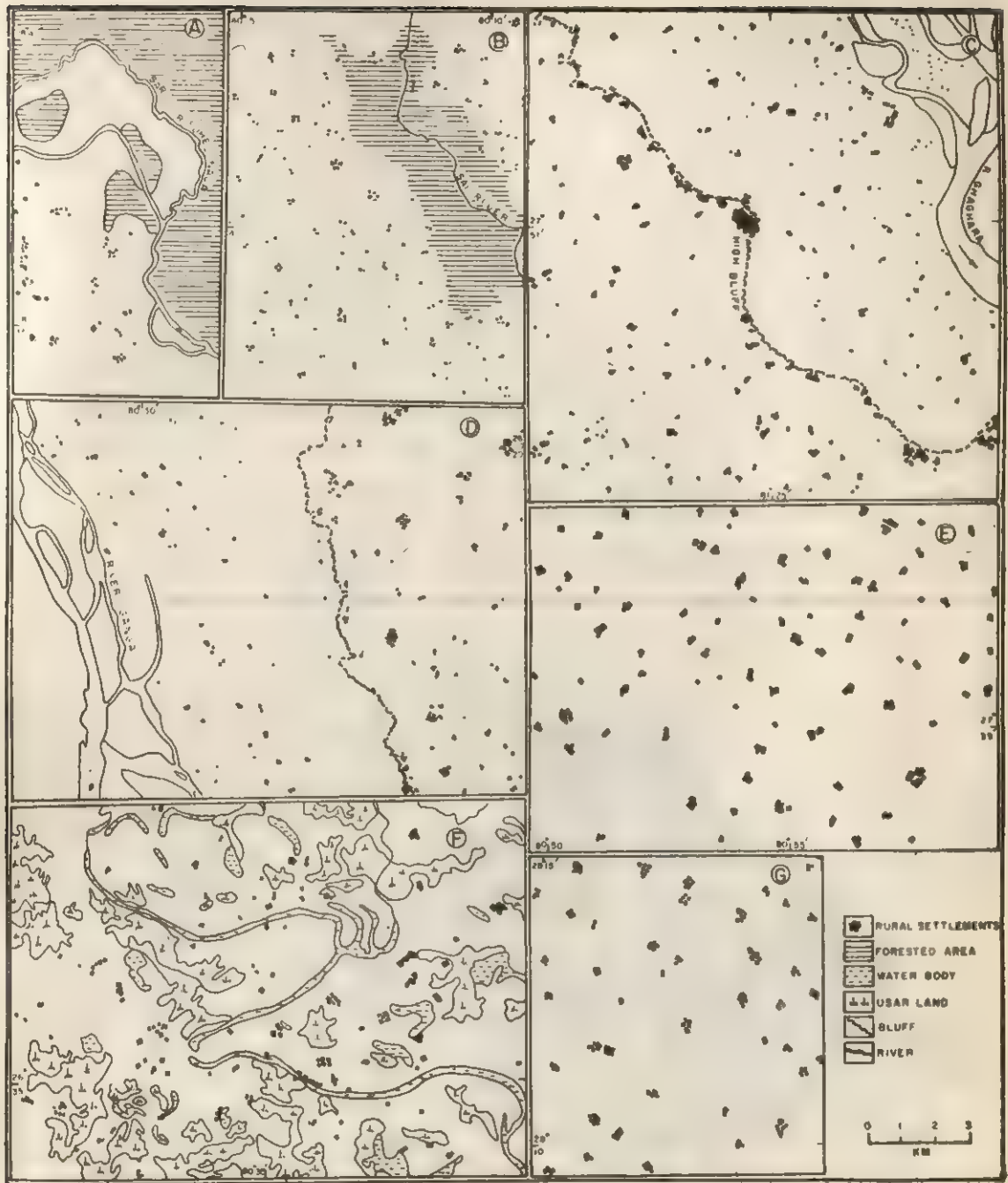


Fig. 4.8 : A to G illustrate settlement patterns in relation to terrain.

settlements are seen in the narrow *khadar* of the Ganga and the Ghaghara but the high bluffs are occupied by large rural settlements (Fig. 4.8). In the central part of the region, the margins of the usar lands are also studded with large and medium compact and semi-compact settlements.

Morphology of Rural Settlements : The village has been both a cultural and physical entity since ancient times. If the physical factors of the site have provided a mould for pattern-formation, the cultural factors have given the sustenance and vitality. The concept of *Dih* is symbolic of traditional attachment to the site of the settlement of the growing village community while the decayed *Dih* has ever remained unwanted, and thus preserved, amidst all the life around. The settlement has also preserved the various layers of the social fabric with provision for group segregation within the village territorial limit and in consonance with the need of the time.

The village is seldom an isolate; it is an essential part of a large territorial unit developed in

the process of land occupance. Such territorial units have continued to this day in more or less similar form maintaining uniform rural polity though the general political order at the national as well as regional levels has been registering frequent changes.

The individual village may be dominated either by a single group or a number of significant rural communities some of which may be insignificant at the territorial level. For instance, the Upper Doab, a territory with Jat dominance does provide for a Muslim, Rajput and Tyagi villages.

Kaili (Panchi)—A Tyagi Village : The village Kaili ($28^{\circ}47'$ N. and $77^{\circ}45'$ E.), commonly known as Kaili-Panchi is a fairly large village (1969 pop. 3,172; 600 hectares) of Hapur tahsil (Meerut district).

The village is compact²⁰ and consists of 8 *mohallas* with the central place known as *Bich-Pathia* which serves as the nucleus around a temple. The Tyagis, the predominant caste of

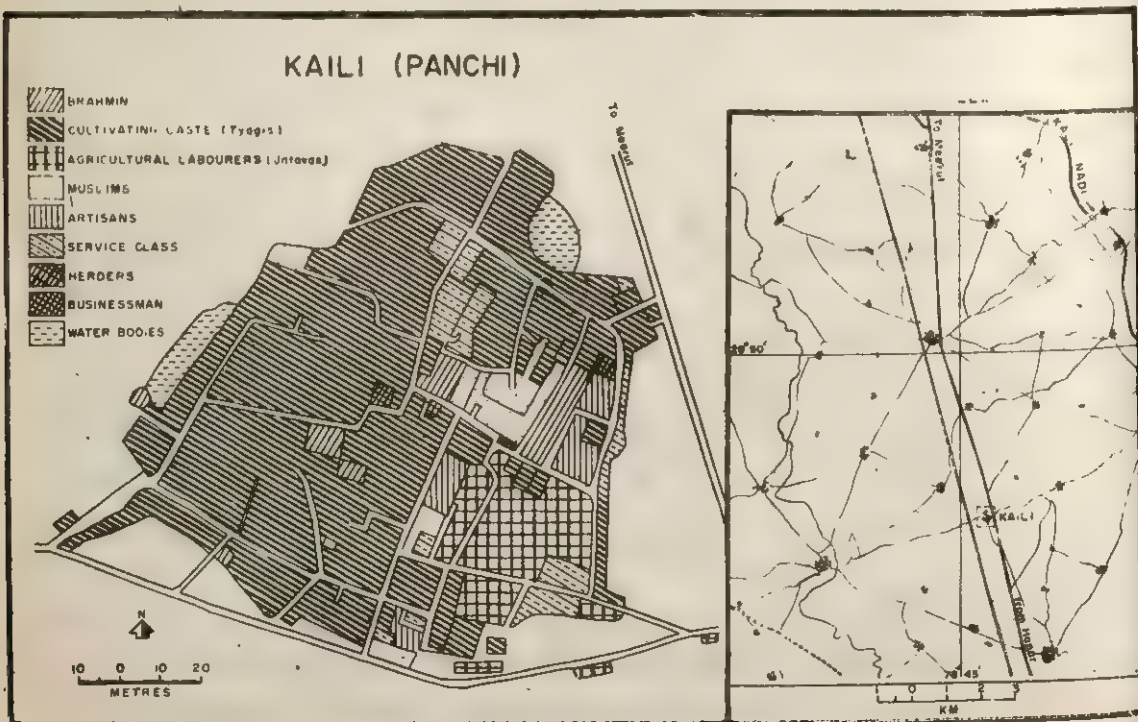


Fig. 4.9

the village, occupy this central zone with minor intrusions by other castes such as Brahmins; in the eastern half of the village reside more than a dozen other castes (Fig. 4.9). Scheduled castes cover the south-eastern corner.

Out of 472 houses 75 percent are pucca with flat roofs. Thatching predominates among the poorer section, particularly of scheduled castes and Muslims. Most of the houses in weavers' colony, Ramgathi, are of adobe type. On an average there are 7 persons per house. Functionally the houses can be grouped into three types: *Gher*, *Ghar* (residential) and *Ghar-Gher*. The north-western and southern outskirts of the village are occupied by *Gher*s while in the centre

and in the eastern side are the residential houses (*Ghar*). 62% of the occupants are Tyagis, 14% Jatavas, 5% Bhattis, 4% Muslims and the rest are scheduled castes and shepherds, etc.

The village has a mixed agricultural economy: Crop farming along with the rearing of cattle and sheep is significant. The major crops grown are sugarcane and wheat, the former occupies 50% of the cropped area and the latter 45% of the *rabi* crop. Majority (56%) of the villagers are engaged in cultivation and considerable proportion (10%) is also engaged in services elsewhere, such as at Hapur in sewing machine factory, oil and saw mills and metal works. The village with 98 buffaloes produces about 9 quintals of

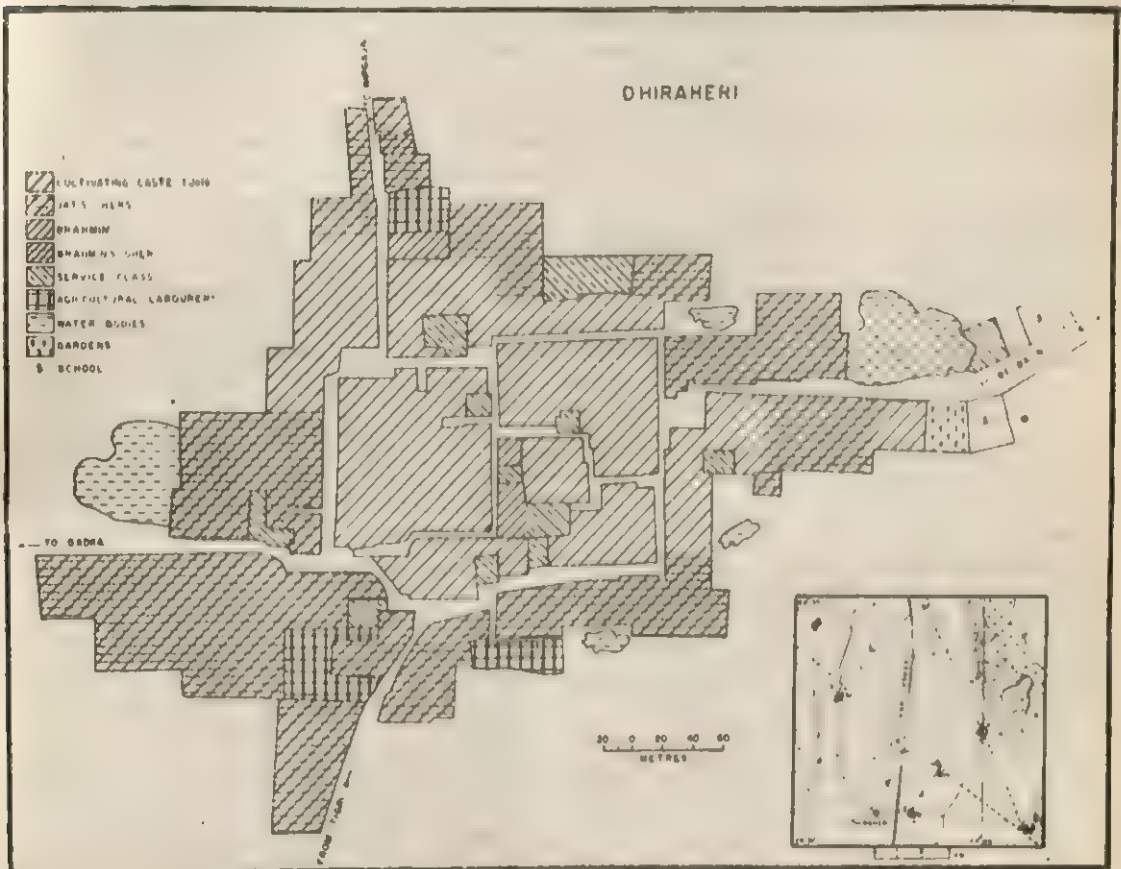


Fig. 4.10

milk daily and supplies milk and its products to the Hapur market.

Dhiraberi, a Jat village (29°31' N. 77°52' E.) in the level alluvial plain is situated on the left bank of the Ganga Canal in Muzaffarnagar district. This is a compact village. The lanes and alleys of the village intersect almost at right angles and up to the middle of the 19th century (c. 1864), it was almost a rectangular village. The main arteries lead to an open area (Chauk), around the old compact block of the village (Fig. 4.10). Three-fourths of the village lanes are paved with bricks.

Most of the houses (nearly 70%) are pucca with plastered wooden roofs. Cement and concrete roofed houses comprise 20% while mud houses are only 8% of the total. About 30% of the houses have one or two rooms, about 18% four rooms, 25% five or six rooms and 27% seven or more rooms. The outer parts of the settlement are mostly occupied by *ghers** and *kothis* of Jats.

The total population of village is about 1,453 (1969), of which Jats, the cultivating caste constitute 65%. Most of the land is owned by them and their houses are mostly located in the central rectangular block. Closeby are the houses of cultivating Brahmins and service class—*Barabis*, *Kumbars*, *Nais*, *Kahars* and *Dhobis* being accommodated by the jats in their own sector during the early settlement. Of the total population 68% are cultivators, 16% agricultural labourers, 5% Julahas, and the rest belong to the service class. Due to nearness of the Main Ganga Canal, all the cultivated lands are irrigated and double and triple cropping is practised. The villagers are providing education for boys and girls both. About 250 boys and 50 girls are receiving education, out of which 120 go outside the village for higher secondary and higher studies.

Sisauli—A Rajput Village³¹: Village Sisauli (29°N and 77°54' E) is situated along the Meerut-Garh road, 14 km from Meerut city. This is a

compact village. The number of the houses has increased by nearly 33% during last 100 years (1855 to 1969). At present, there are 127 *ghers* (23.4%), 359 *Ghars* (66.5%) and 36 *gharghers* (6.35%); the rest include 11 shops, 6 Government buildings and a mosque and a temple (Fig. 4.11). Mostly the *ghers* are located in the outskirts of the settlement. The *ghers* are bigger in size and belong to cultivators. 37.2% houses have two rooms, 35.4% two to four rooms and 8.5% more than 4 rooms. The rest are either one-room houses or huts. The roofs of the majority of the houses (73.27%) are made of brick and wood. Almost all the pucca houses (58%) belong to the Rajputs and Brahmins while service castes and artisans live in the *kuchcha* houses (39.4%).

The population of the village has doubled during last 50 years. By caste, Rajputs are 47.3%, Muslims 10.7%, Harijans 5.7%, Brahmins 4.5% and the rest comprise business men, service class and other castes. 54.1% are land owner cultivators. The average holding is 3.34 acres. Nearly 27% people earn their livelihood as agricultural labourers and 6% are artisans and service class people. The village has a very high percentage of literacy (43.3), mainly due to the nearness of Meerut city. Graduates and post-graduates are in good number (80).

Due to good transport facility and nearness of the city, the village is growing rapidly and the sources of income of the people show greater promise. Vegetables and other cash crops are being produced on a large scale to feed the city market.

*Dholri*³²: A Muslim Village: Village Rasulpur-Dholri (28°55' N and 77°3' E.), commonly known as Dholri, is an important large village (688 hectares; 1967 pop. 4,630) near the river Hindan in the fertile Upper Ganga-Yamuna Doab almost in the centre of Meerut district. The total land under village settlement is 26 hectares.

Pucca houses with wooden planks are most common in this village which constitute about 65% of the total houses, followed by cement-concrete-roofed houses (16.35%). Mud houses are declining fast and at present account only for

**Gher* is a local name used for the place where cattle, implements, fodder etc., are kept and which also serves, in most cases, as a sitting place for male folk.

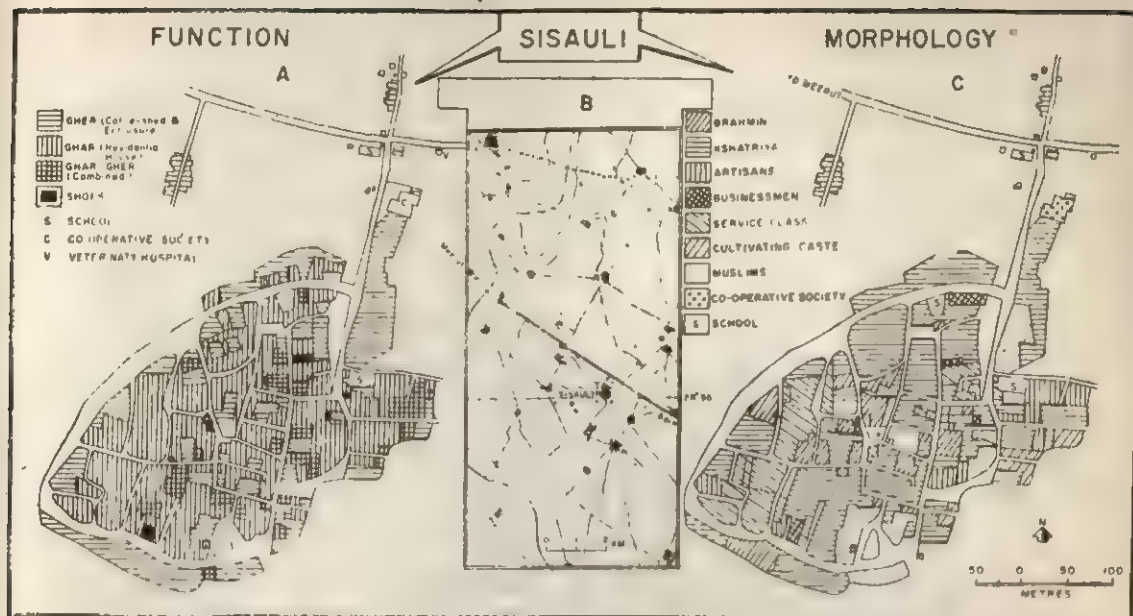


Fig. 4.11

15% of the total. About 25% of the house-holds have only two rooms followed by those having four rooms (16%). Another 25% have five to six rooms whereas 20% possess seven or more rooms.

Various cultural factors and social customs appear to have guided the clustering of houses belonging to different castes. Around the original settlement nucleus of the village, the Kot, the residential area of the Sayads, the servicing classes have settled. Another section, including mostly cultivators and artisans, have occupied the areas next to the servicing class. On the outskirts live the cultivating class, landless labourers (most of them are chamars and shah faqirs) and Bhangis (Fig. 4.12).

Out of the total population 68% are Muslims. About 44% of the total population constitute the workers. Though cultivation is the main occupation of the villagers, the orchard economy has influenced almost the entire population of the village in varying degrees. Presently, about one-third area of the village is devoted to orchards and about one-fourth of the population is engaged in the trade of their produce. Mangoes, peaches,

loquat, litchis are the main fruits grown in the village. About 60% of the total earning of the villagers is from orchards. Nearly 300 children are receiving their basic education in the four schools of the village, and about 100 students go outside for higher education.

*Behat*²³, an overgrown village (1961 pop. 6,083) of the Ghar Region, is situated at a nodal point on Saharanpur-Chakrata metalled road, about 26 km from Saharanpur city; it is also joined by seasonal roads to Shakunbri Devi temple and to village Mahmud Majra Raipur to its N.W. A road from Akalsia, about 4 km south of it joins Behat with Muzaffarabad and also with the parts of the central Ghar (Fig. 4.7).

Although an ancient Buddhist site, Behat grew up as an important central place during the Rajput and Muslim periods. In the days of Akbar it was made the headquarters of a pargana, called Behat-Khurnawar. In the early 17th century its expansion took place towards the north-west, mainly around a mosque. The later developments have occurred westward away from the main road, around the village *bat* area.

DHOLRI



Fig. 4.12 : Village Morphology

Out of 770 buildings 110 are used for non-residential purposes. About 41% of the houses are either pucca or constructed of mixed material; 48% are mud-walled and thatched roof structures. The houses of high status comprise generally 5 rooms and in exceptional cases the rooms may increase to over a dozen. The medium status houses contain 2 to 5 rooms, while the poorer structures, are of one or two rooms with or without a court-yard.

About 63% of the total population are Muslims and their concentration is maximum in the north-west. Among other religious groups are the Hindus including Harijans. While Harijans are confined to the south-west, other Hindus have spread in south-central parts, more or less in rectangular blocks. The non-residential buildings have grown mostly along the metalled road and in the central parts to the east of the Muslim-dominant areas (Fig. 4.7).

About 32% of the total population consists of workers. Over 70% of the workers are engaged in primary and miscellaneous functions while over one-fourth is dependent on commerce and industry. The main business activities are concentrated in the *hat* area within four corners marked by mosques.

Urban Settlement

Though the region may not yet be considered as an urbanized one, it contains most of class 1 cities of Uttar Pradesh (12 out of 17). It comprises more than three-fourths (76.6%) of the urban population of the State. Out of the total population of 45 million in 1961, 7.2 million persons (16.5% of the total) were enumerated as urban, living in 164 towns scattered all over the region. This urban population is very unevenly distributed in the area. The degree of urbanization increases from east to west in general and the existence of a few well-marked belts of urban concentration is noteworthy.

About one hundred towns consisting of about one-third of the State's urban population are studied in the western zone covering only one-seventh of the State's total area. It is the most urbanized part of the region. This feature is unique, as the general economy of this area is also agricultura-

as in other parts, and as such, this trend calls for explanation. "This zone has been of great strategic importance : during the medieval times it was the Muslim-Rajput marchland; the waves of invasion from the west often spent themselves in the Ganga-Yamuna Doab and many of its smaller centres are obviously the descendants of groupings around forts."³¹ During the 18th and 19th centuries, the area witnessed rise and fall of a number of local chiefs resulting into an atmosphere of war and horror. All this accounted for the origin of compact villages grouped along defence points which, in due course of time, developed into local markets. Later on, the development of railway network, irrigation canals and the electric grid paved the way for an economic prosperity of the area, and thus these urban nuclei got impetus to grow.³⁵

TABLE 3

Distribution of urban population in the different regions of the Upper Ganga Plain (1961)

Regions	% of urban population to total population	% of urban pop. to total urban pop. of the State
Rohilkhand	16.9	14.2
Awadh	9.5	15.2
Doab Upper	18.1	24.0
Doab Lower	24.3	17.1
Yamunapar	31.4	6.1
Upper Ganga Plain	16.5	76.6

Upper Ganga Plain South (21.2%) is more urbanized than the North (12.1%). In the Yamunapar Plain proportion of urban population is the highest (31.4%) (Table No. 3). It is mainly because of the urban influence of Agra and Mathura. Lower Ganga-Yamuna Doab (24.3%) comes next to it accounting for nearly one-fifth of the State's urban population. Upper Ganga-Yamuna Doab (only 18.1%) contains about one-fourth of the urban population of the State. Rohilkhand and Awadh also have considerable amount of urban population and jointly count nearly 29% of the urban population of U. P.

It is obvious that the higher the rank of the class, the greater is the proportion of urban population contained therein,³⁶ with the only exception found in the share of second class towns. Class I towns account for more than half of the urban population (56%) or 42.8% of State's total urban. Class II towns, 14 out of 16 in U. P.

contain only 13.3%, while class III towns share slightly above this (14.7%). Thus about 70.0% of the total urban population of the region is concentrated in towns of 50,000 and above. The remaining three classes comprising 138 towns share less than one-third of the urban total (Table No. 4).

TABLE 4
Distribution of Urban Population by Classes of Towns, 1961

Class	No. of Towns	Population	% of the region	% of the State
I 100,000 & above	12	4,063,398	56.1	42.8
II 50,000-99,999	14	964,315	13.3	10.3
III 20,000-49,999	35	1,061,924	14.7	11.3
IV 10,000-19,999	55	776,668	10.7	8.3
V 5,000- 9,999	48	371,490	5.2	3.9
Region	164	7,237,795	100.0	76.6

The urban concentration is heaviest in the Doab and adjoining regions where towns are close to each other and form rather a continuous zone. In other parts of the region the urban centres are generally scattered. Even the two largest towns of the region, Kanpur and Lucknow stand isolated.

The western part of the region has two distinct urban belts: one running from north to south in the Doab from Saharapur in the north to Etawah in the south, with two conspicuous agglomerations—(a) Aligarh-Hathras-Mathura-Agra-Firozabad and (b) Ghaziabad-Hapur-Meerut-Muzaffarnagar-Saharanpur-Hardwar; the other belt passes through Rohilkhand from Bijnor to Fatehpur comprising Amroha-Moradabad-Rampur and Pilibhit-Bareilly-Budaun and Etah agglomerations.

Functional Character: Most of the towns and cities of the region are multi-functional. Out of 26 towns having population more than 50,000 as many as 20 have largest number of workers in services and 4 in industries. There is only one town, Hathras, which shows a high proportion of workers engaged in trade and commerce (32.3%). In fact, only two centres can be treated as industrial—Firozabad (63.5%) and Kanpur (42.2%).

Kanpur is the industrial metropolis of U.P. and its commercial significance is mostly related to the industrial products, while Firozabad has gained prominence mostly for household and cottage industries. In several towns, like Aligarh, Agra, Bareilly etc., services come next to industries in employment. Rest of the large urban centres are multi-functional where trade and commerce are prominent. Sambhal (Moradabad) is only a large town where primary activities are notable.

Morphological Structure: There are appreciable variations in the morphology of towns of the Upper Ganga Plain due to size and functional variations, and in general, like most Indian towns, they lack in some of the basic aspects of 'unity of layout and function'.³⁷ Most of them are conglomerates of discrete, including rural and semi-urban, nuclei of diverse origins, rather "a collection of 'period' pieces" of ancient and medieval times, and as such, structurally speaking, they are severally built. One characteristic, however, is common to most of the pre-modern cities: each has three, easily distinguishable characteristics in layout and associated functional land use characteristics: (1) the pre-British 'indigenous' part, forming the major portion, the British or 'Anglicized' appendage, functionally and struc-

turally different and contrasting with the former, and (iii) the recent, post-Independence development.

While the main roads and streets are relatively wider, other streets are narrow, irregular and winding 'living streets' passing through the congested, rather thoroughly built-up, areas though a few sections or even some individual bungalow-type houses may have open space. The buildings are mainly pucca, generally two to three storeyed in the main commercial or inner areas, but tend to be one or two-storeyed in the middle zones and mixed or kachcha on the peripheries. Temples, monasteries and mosques are the usual dominant features. The British period appellations are spatially separate, more spacious in layout and functionally different; they are mostly in form of cantonments, civil lines, railway colonies, and other institutions such as hospitals, schools, etc. In the post-Independence period and even earlier the industrial, educational (on private initiative) and other institutions, planned and semi-planned residential colonies and even markets developed in the interstitial spaces between the old parts and Civil Lines and Cantonment or on the other peripheral sides. Many large towns have now Industrial Estates and planned colonies.

Almost invariably the commercial functions have developed on the main regional thoroughfares or streets, which culminate in the 'Chowk' or the crossings of such routes; chowk is core of the retail business dealing in all sorts of consumers' goods from food, cloth, hardware to jewellery, cosmetics and other goods and services, and it is from this core and the related thoroughfare that business streets emanate with specialized trades and services. It is in this core area also that business office, hotel and restaurants, banks and other business institutions may be found on the first or even second floors of the buildings while the rear is given partially to ware-housing or workshops; elsewhere the frontage is given to business, while the other storeys and the rear are mostly used for residences. There are specialized, mostly enclosed sections or streets for wholesale business, separately known as *Galla*

Mandi (grain market), *Sabzi Market* (vegetable market), etc. Large scale industries have developed in separate quarters to be qualified as industrial zones, though quite a few units are mixed with other functional areas. Household industries, however, may be found in special sections or mixed with residences. Excepting Meerut, five big cities of this region namely, Kanpur, Lucknow, Agra, Allahabad, and Bareilly lie on the Ganga or its main tributaries the Yamuna, the Ramganga and the Gomati. 'Though these cities lie in rather the same geographical setting, their origin and growth have been affected by different historical and geographical factors.'³⁸ Allahabad (Prayag), at the confluence of the Ganga and the Yamuna has been famous for its religious sanctity. Agra and Lucknow developed as capital centres. The fort town of Agra, standing on the western bank of the meandering Yamuna, formed the first line of defence alongwith Delhi against the invaders from the west. Lucknow, lying in the centre of the Awadh Plain, was the headquarters of the Nawabs of Awadh. Bareilly grew as a trade centre in the Rohilkhand Plain. Kanpur, the youngest amongst the KAVAL³⁹ cities of U. P., developed as a typical industrial and commercial city. Meerut, situated in the centre of the Upper Doab, grew as a regional centre though originated as a fort town.

Though endowed with various geographical advantages of site and situation and ancient cultural heritage, these towns have largely grown owing to accretion of modern functions. The population curves of these cities show significant rise from 1931 though with remarkable variations (Table 5). According to 1951 census, Kanpur was the only city in U. P. having population more than half a million, but in 1961, Lucknow and Agra also crossed the mark, while Kanpur has risen to be almost a million city. Rampur, however, has remained almost stagnant since 1951.

Agra (505,680), has enjoyed a strategic situation with the Fort standing on the great arc of the Yamuna. The early Muslim city grew to the north of this citadel, along the river near the

TABLE 5

Cities (Class I)	Percentage increase (1951-61)	Cities (Class I)	Percentage increase (1951-61)
Kanpur	37.6	Moradabad	18.5
Lucknow	31.9	Saharanpur	24.8
Agra	35.4	Aligarh	30.6
Meerut	21.8	Rampur	0.8
Allahabad	29.6	Mathura	18.4
Barcilly	31.1	Shahjahanpur	12.3

Jama Masjid, which functioned as another nucleus for the settlement of the Muslim commu-

nity. The business districts as usual then were located near the built-up area not far away from

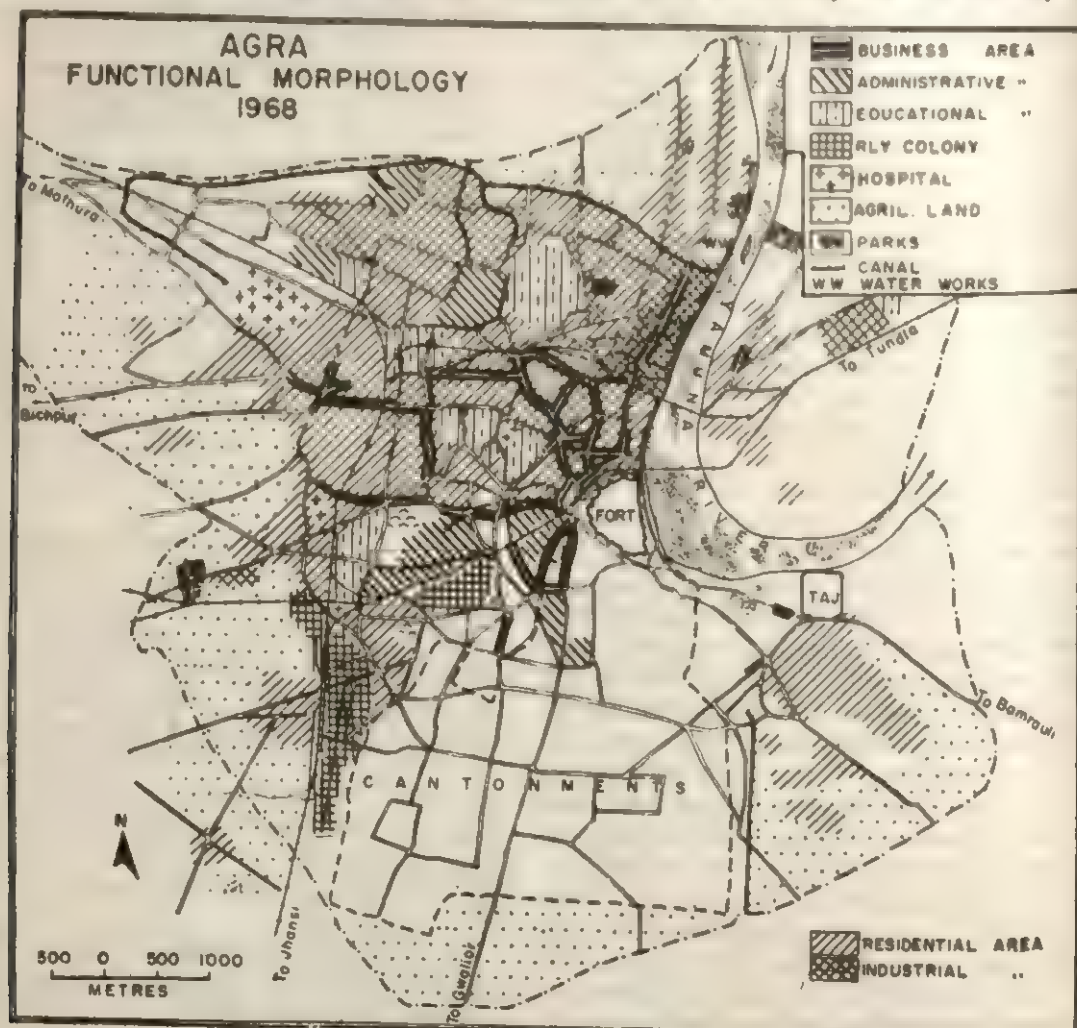


Fig. 4.13

the river which served as the cheapest means of transport. Thus, Kinari Bazar, Pipal Mandi Road, Rawalpara, Kashmir Bazar, etc. developed consisting of some of the important business-cum-residential localities of the city and present highly congested quarters nothing better than slums. Further extension of the city took place to the north and west and avoided the ravines and bluffs lying in the south-west. The Medical College and Hospital and several large educational centres like Agra College, St. John's College, B. R. College etc. (Agra University) occupy the peripheral position to the west of the city. The new residential localities developed on the western and northern periphery are open and rather planned (Fig. 4.13).

The construction of the City and Belanganj Railway Stations in the north, where ample open land was available on the bank of the river, provided for modern industrial development there. The industrial Agra, with modern cotton mills, spinning mills, carpet factories, oil mills, flour mills, iron foundries etc., extends in a narrow strip along the bank of the river. The carpet weaving industry and marble works, the two famous industries of Agra, developed more owing to the patronage of Muslim Kings than due to some important geographical influences. Though the carpet industry is on the decline due to competition from other parts of the country and also from abroad, marble industry is still important, particularly due to tourism which is encouraged by the presence of Taj and other famous historic buildings.

Lucknow (655,673) is known as the 'City of Gardens' of Uttar Pradesh owing to the higher percentage of area under parks and gardens. The earlier settlements occupied the higher grounds stretching south of the Gomati near the original citadel at the site of the present *Machhi Bhawan*, due to the danger of floods. The first business district grew up in the centre of the early built-up area, and *Chauk* is the earliest developed business quarter in Lucknow. Here lie the famous gold and silver markets of the city and other retail business. As the land further south was occupied by large depressions, the built-up area extended

first to the southwest and then to the southeast where stands the Aminabad market, another important business area of the city.

The greatest land-mark in the history of evolution of Lucknow began with the construction of the Bund Road (road running on the embankment) along the river in the eastern loop in the north-east. This made a vast tract of land safe from floods where the Civil Lines and the administrative zones were planned. Here lies Hazaratganj, the most important and fashionable market of Lucknow. This is highly modernized business street with stores, hotels and restaurants, cinema halls etc. This road leads to the vast administrative zone of the Civil Lines in Lucknow. The U. P. Assembly House, Government House, Secretariat, State Departmental Offices, Minister's bungalows, the zoo and the park, all combined present a modern outlook (Fig. 4.14).

On the western side the Hazaratganj road leads to a vast open and grassy patch of land extending up to the river bank. Farther west lie the Medical College and Hospital.

The construction of several bridges on the Gomati rendered possible the extension of the city to the northern bank of the river. Immediately to the north of the Monkey Bridge lies the campus of Lucknow University. Farther east, the river is crossed by the Iron Bridge beyond which is located the Paper Mill. Here several small residential localities like New Hyderabad, Nishat Nagar, Badshahnagar etc. have sprung up.

Lucknow is predominantly an administrative and cultural centre of the State and has only a few large-scale industries.

Kanpur (971,062) is the youngest city amongst the 'KAVAL' towns. Originally a military cantonment at the border line dividing the then British frontier from the province of Oudh and the territory of the Moghul Kings of Delhi, it has become one of the most important industrial centres of the country. Before the National Uprising of 1857, the cantonment covered an area of about 28 km² stretching along the river front. The main city was enclosed by the cantonment on three sides and city's expansion was possible in one direction only in the triangular



Fig. 4.14

space enclosed by the Ganga canal in the east and the cantonment boundary in the north and west. This naturally resulted in great congestion in the main city.

After 1857 many industrial concerns were established at Kanpur. The city had already become famous for tanning and curing of leather

and for the production of leather goods, especially of boots and saddlery for the military. The period 1863-1885 witnessed the development of great industrial establishments, i.e., the Government Harness and Saddlery Factory, Cooper Allen Co., North-West Tanneries Ltd., and several cotton mills like Elgin, Muir, Victoria,

Kanpur Woollen Mills and Army Cloth Manufacturing Co. Ltd. etc.

After the construction of railway line, the railway station and the railway colony were developed to the south of the then built-up area. With the expansion of the railway yard, it became more advantageous for the factories and small mills to occupy a site in the southern periphery. This led to the establishment of chains of ginning presses and mills in the south of the city. Thus the industrial area of Kanpur forms two zones : (i) In the north of the city proper, (ii) In the south of the city proper. At present

the city is extending towards south beyond the railway colony (Fig. 4.15).

The city proper is crowded and some of the old built up areas have developed into virtual slums separated by narrow lanes. The Mall is an old market serving the city as well as the cantonment. Nayaganj is the largest grain market. With a view to providing better accommodation open market of Collectorganj, now the centre of grain trade lies on the Chauk road which is a narrow lane lined with shops and business houses running west to Collectorganj.

Thus industry dominates all spheres of life in

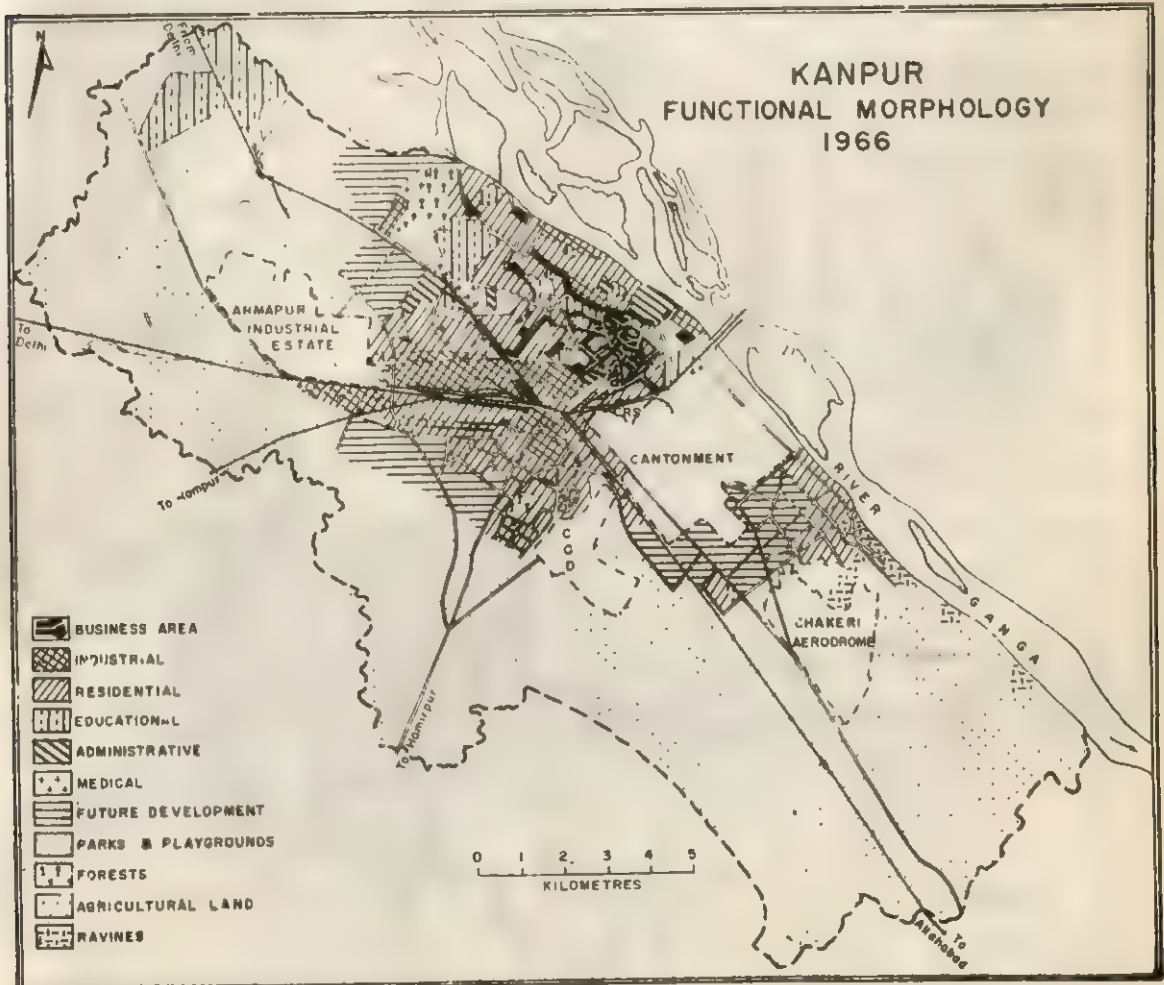


Fig. 4.15

Kanpur. It has become an important centre of advanced education including technical; the I.I.T. has added a new township to the city.

Allahabad (430,730), the ancient Prayag on the confluence of the Ganga and the Yamuna and the mythological (subterranean) Saraswati has grown on the higher ground of the fork area (above 30 m) of the Ganga and the Yamuna. The rivers encircle the town on three sides. The *Chauk* in Mirganj area is the main business centre and the business arteries extend up to Johnstonganj. Around this core, especially in the SE, lies the

wholesale grain market of Muthiganj. The core and the surrounding area are highly congested business-cum-residential areas. In contrast, the more open residential colonies of the Civil Lines (Checker-Board Plan), Railway colonies and some modern housing colonies have given a new look to the townscape (Fig. 4.16). The cantonments surrounded the city from three directions; the fort cantonment in the east, the old cantonment in the north and the new cantonment in the west, which rather have restricted the city-growth.

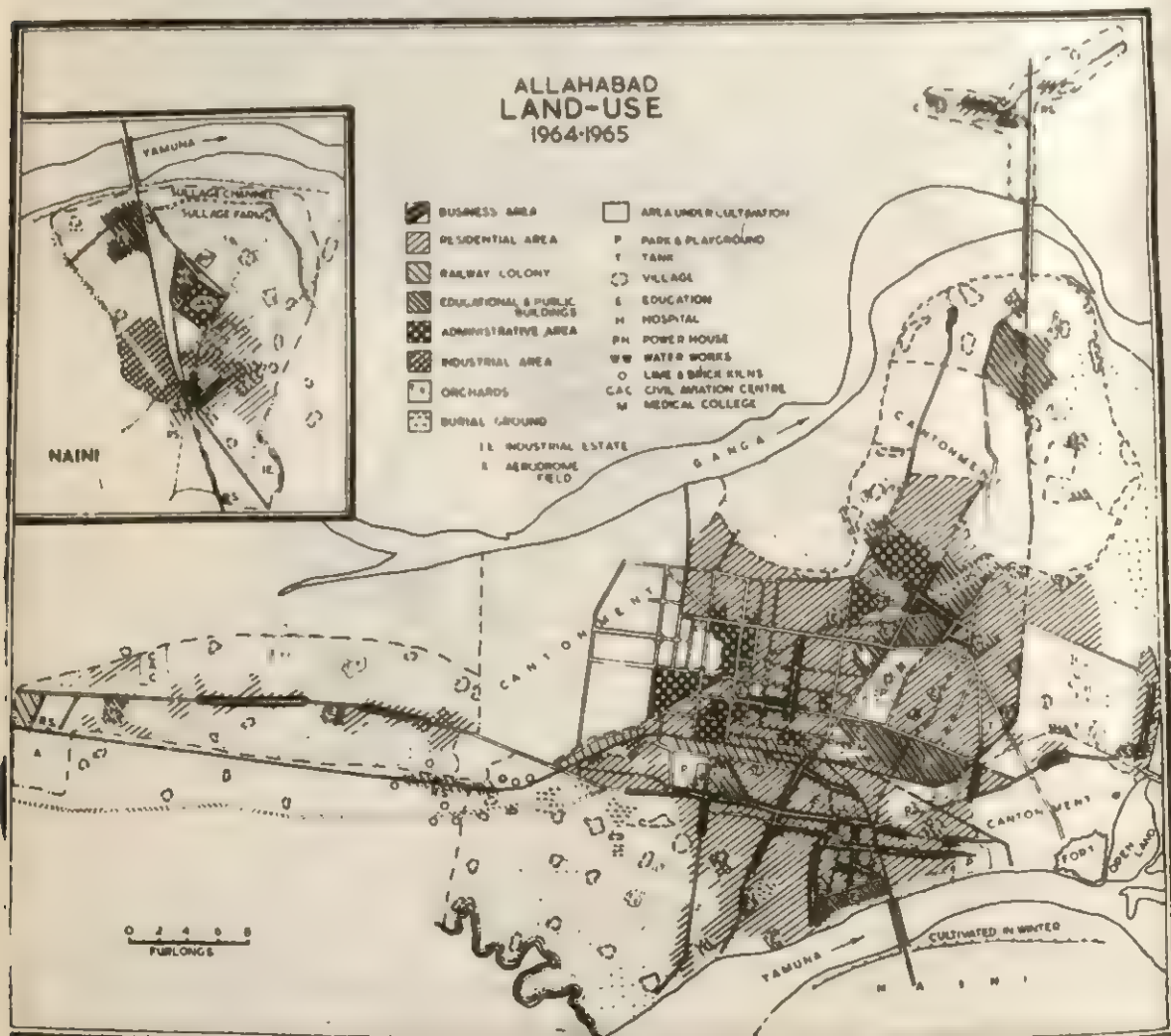


Fig. 4.16

The industrial landscape is little developed within the fork area, and recently an Industrial Estate has grown beyond the Yamuna at Naini. The city is an important educational, professional and administrative centre and the associated landscapes have developed in the outer fringes. The University area is marked from the air by the pinnacle of the Senate House.

Meerut¹⁰ (283,997) commands a position of importance in the highly urbanised zone of the Upper Ganga-Yamuna Doab enjoying sixth rank among the largest cities of the State. From its early growth around the Andercot Fort the city grew into prominence and attained a respectable status during the Ashokan period. During the Moghul period, in Akbar's reign also, it achieved political and economic importance. Its modern growth started with the establishment of a military cantonment, and with

its elevation as district and regional headquarters. First and Second World Wars gave encouragement to the development of the industrial landscape. Since Independence, the city has experienced a new phase of all round growth with consequent rise in urban population and spread of the city towards the periphery, where several new colonies with modern amenities have sprung up. Recently its educational status has been raised by the establishment of the Meerut University.

The core of the city is multifunctional and includes wholesale and retail markets and administrative, commercial and banking institutions. The middle zone is mainly residential mostly with dilapidated buildings. Small working units, transport agencies and a few old factory sites are also present here. The outer zone is characterized by numerous open spaces and scattered re-

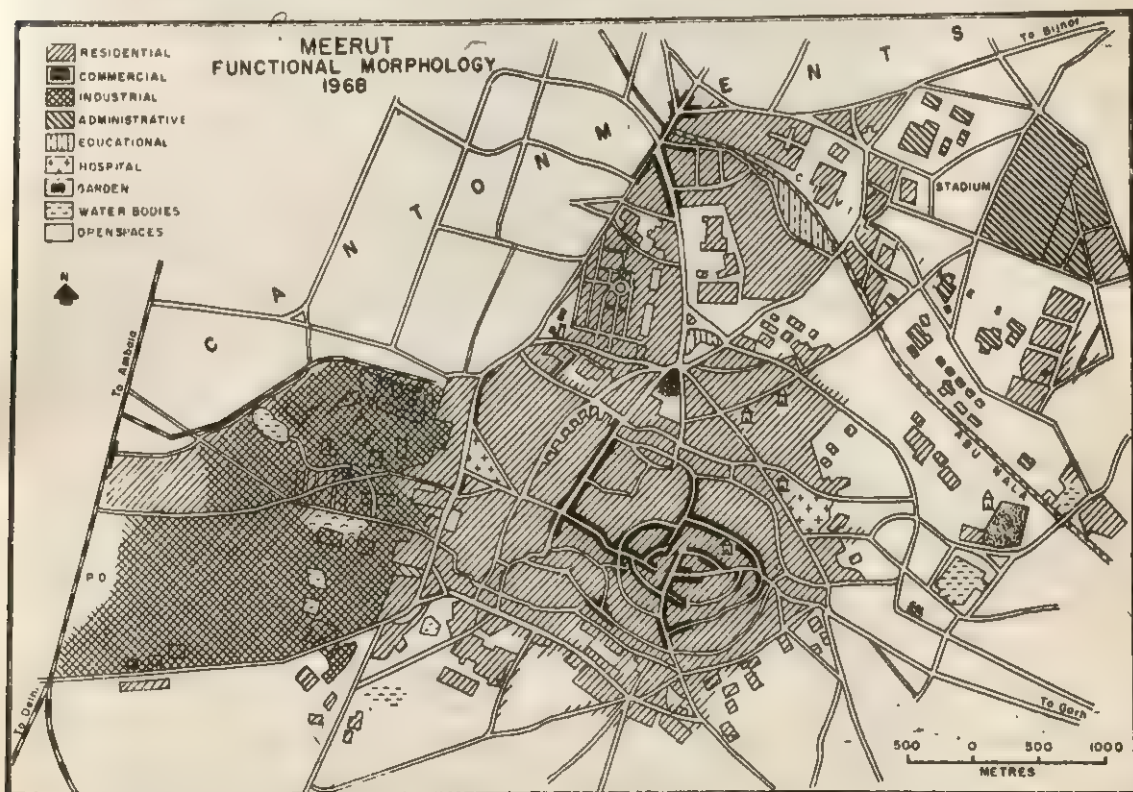


Fig. 4.17

sidences and other buildings with large compounds. Several industries have also developed here, notably on the Delhi-Baghat road and the Station road. All around the city in this zone, planned residential colonies, such as the Begham Bridge and Thapar Nagar area, have developed. The Civil lines and the Cantonment are distinct in pattern and layout and have hotels, clubs, cinema houses and shopping centres etc. Further development of the city along the road-side is quite remarkable (Fig. 4.17).

Bareilly (272,828), the divisional headquarters of Rohilkhand, has developed on the left bank of the Ramganga. It is a medieval fort town, founded by a Rajput chief in 1537. In 1657, it was made the capital of Katchar and a new city was founded by Makrand Rai just a mile to the west. It gained importance during the rule of Hafiz Rahmat Khan, a Rohila Sardar, when most of the expansion of the town took place. The British established the cantonment in the south of the city and later several institutions were added, such as Mental Hospital, Veterinary Research Institute, Railway workshops and colonies and sugar and *kattha* factories. Since Independence, the city is expanding towards the southwest and north-east, and many new residential colonies like Murtza colony in the Civil Lines, Prem Nagar near railway station and Model Refugee colony near Shahamatganj have developed.

Though the city is chiefly administrative in character, it has also attained importance in industrial activity with several factories for manufacturing sugar, turpentine, *kattha*, matches, synthetic rubber and chemicals etc. The development of Clutterbuckganj as an industrial fringe, having several factories like Wimco Match factory, turpentine, bobbin, resin, etc., is notable.

The business areas lie on the Rampur-Shahjahanpur road, which divides the city from north and south into two equal parts. Budaun-Naini Tal road forms another business-street crossing the main business road in the centre. The principal administrative offices and buildings, court, etc., are in the southern part of the city near the cantonment boundary. Almost all the area

north of the main business street is residential in which old city consists of low and medium class residences. In the Civil Lines and at the edge of the built-up area of the city there is dominance of high class residences. Slums can be seen at Baqarganj near River Nakatia Bridge and at Nekpur along Budaun road.

The railway tract and the river in the west, Izarnagar Railway colony in the north and the cantonment in the south, are limiting factors to the growth of the city in these directions. The future extension of the city is only possible towards the east and north-east (Fig. 4.18).

Agricultural Economy

The regional economy is dominated by agriculture which together with the allied activities forms the most important source of employment and revenue. Though, in general, the proportion of the net sown area to the total area is high, being over 65%, there is a wide sub-regional variation which gets sharper at district and tahsil levels. The Yamunapur tract has the highest proportion of net sown area with 73.1% in Agra and 82.0% in Mathura district. Over 70% of the total land is under cultivation in the Upper Doab, and excepting only Saharanpur (66%) all other districts record between 74% (Muzaffarnagar) to over 78% (Aligarh); in the Lower Doab all districts range below 70% (Etah and Kanpur) reaching as low as 62% in Mainpuri. In the Rohilkhand Plain also the range varies from 61.3% (Bijnor) to 80.0% (Budaun), though with most of the districts ranging over 75%. In the Awadh Plain the variation is widest, ranging from 53.8 (Kheri) to 74.0% (Sitapur), and most of the districts record below the regional average. The *tarai* districts with relatively higher proportion of land under forests, depressions and water bodies and marshes or other agriculturally negative lands show still lower percentage of the net sown area as evidenced by Kheri (53.8%), Pilibhit (55.3%), Naini Tal (27.1%) and Bahraich (65.0%), which have 22.1, 30.1, 66.2 and 14.0% of their land under forest respectively. Likewise, the eastern and several other districts of Awadh Plain have higher proportion of *usar*-infested and other waste and barren lands :

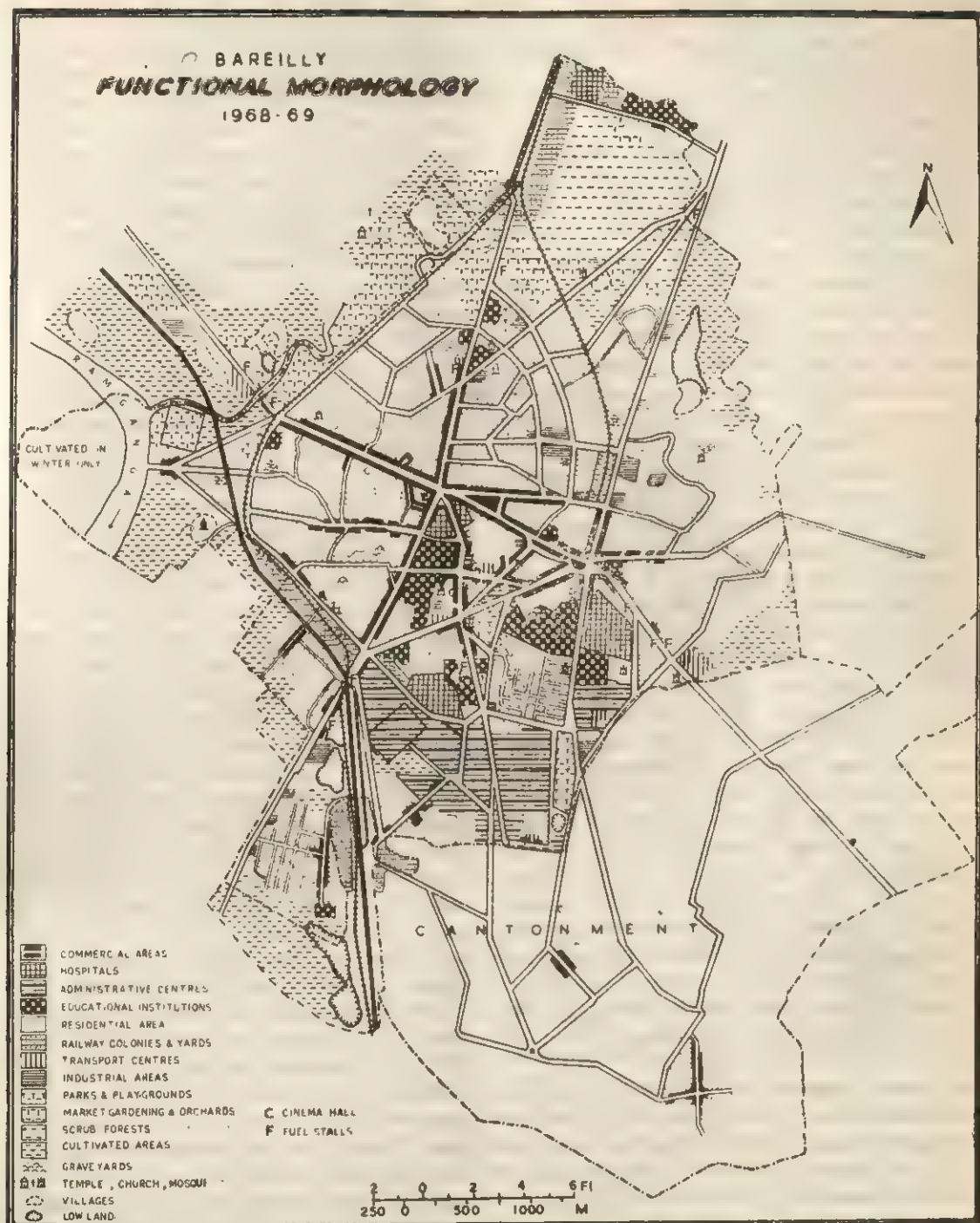


Fig. 4.18

Unnao (17.8%), Sultanpur (13.3), Rae Bareli (17.4), Pratapgarh (11.7) and Lucknow (17.7) provide such examples.

The region has very low percentage of land under forests (8.4) as compared to U. P. as a whole (12.8), and the percentage ranges between almost nothing (Pratapgarh) to 27.5 (Kheri). Most of the plain districts have very negligible forest cover, as many as 24 districts having below 5% and out of them 7 districts recording below 1%. Non-tarai districts of the Awadh and Rohilkhand Plains and most of the Doab districts have particularly low incidence. Among the districts with more than regional percentage under forest cover are mostly the tarai districts—Saharanpur (13%), Naini Tal (66.2), Bijnor (15.6), Pilibhit (20.7), Kheri (27.5), Bahraich (14.0), Gonda (10.3), and only two typically plain districts—Etawah (13.1) and Mainpuri (12.1) fall in this category. The most deplorable situation is obtained, however, in the percentage incidence of permanent pasture and other grazing lands which are so important in a region of a very high density of cattle and other animal population. The regional average is below 0.2%, though more than the State average (below 0.15%). Land put to non-agricultural uses varies from 5.0% (Mathura) to 10.6% (Saharanpur) of the total and most of the districts record more than the average for U. P. as a whole (6.4%). Land under miscellaneous trees and groves is singularly high in a rather compact block of district. Faizabad (7.0), Sultanpur (8.3%), Pratapgarh (7.1), Rae Bareli (8.1), Unnao (5.1), Lucknow (5.1), Barabanki (7.0), and some tarai districts such as Saharanpur (8.2), Pilibhit (9.1) and Kheri (6.2). Most of the Rohilkhand Plain and the Doab, however, record below the regional average (3.7%) under this category of land use (Fig. 4.19a).

There is appreciable variation in the use of the agricultural land. As many as 21 districts have higher percentage of agricultural land under net sown area than U. P. as a whole (84.3%); as such most of them have, quite naturally, lower percentage under culturable waste and current and other fallows than the State averages (8.3 and

7.2% respectively). As many as nine districts, i.e., Pilibhit (9.7), Etah (13.9), Farrukhabad (10.1), Fatehpur (9.4), Allahabad (9.0), Kheri (8.8), Unnao (11.2), Lucknow (11.4) and Rae Bareli (13.4) record higher percentage of cultivable waste which could be profitably reclaimed into improved pasture and grazing lands or even under forests in view of a balanced land use in the region. 5 to 10% of the total agricultural area remains under current or old fallows, which could be cropped with proper soil management, availability of irrigational water and use of manure and fertilizers.

Irrigation : The Upper Ganga Plain is one of the highly irrigated agricultural regions of India and irrigation has played a dominant role in boosting its agricultural prosperity, particularly during the last one hundred years. About 30% of the net sown area is irrigated. There is a wide sub-regional and district level variation in the irrigated percentages. Most of the Upper and Middle Doab, down to Farrukhabad and Etawah, have greater proportion of irrigated area : Muzaffarnagar (59.1%), Meerut (68.6), Bulandshahr (61.2) in the Upper Doab record the highest percentages, more than double the State average, while most of the other districts also in these parts irrigate 30 to more than 50% of their net sown area. In the Lower Doab, however, irrigation becomes less important as is evidenced by the lower percentages of Kanpur (29.3), Fatehpur (26.2) and Allahabad (23.2) districts. The Rohilkhand and Awadh, on the other hand, mostly range between very poor to average in irrigational resources which is partly explained by their lesser irrigational needs; the districts from Bijnor (12.6) to Bahraich (7.9), in fact, irrigate less than 15% of their net sown area, and in the entire sweep of these vast tracts, only Moradabad (22.3) and Budaun (18.5) in the South-West Rohilkhand, and Unnao (28.3), Lucknow (27.7), Barabanki (28.4) and Gonda (26.0) in the east, have 15 to 30% of the net sown area irrigated. The tarai districts, which have higher rainfall and also lower temperature and evapotranspiration have lower water needs than the districts to the south, and Pilibhit (11.1), Kheri (5.6) and

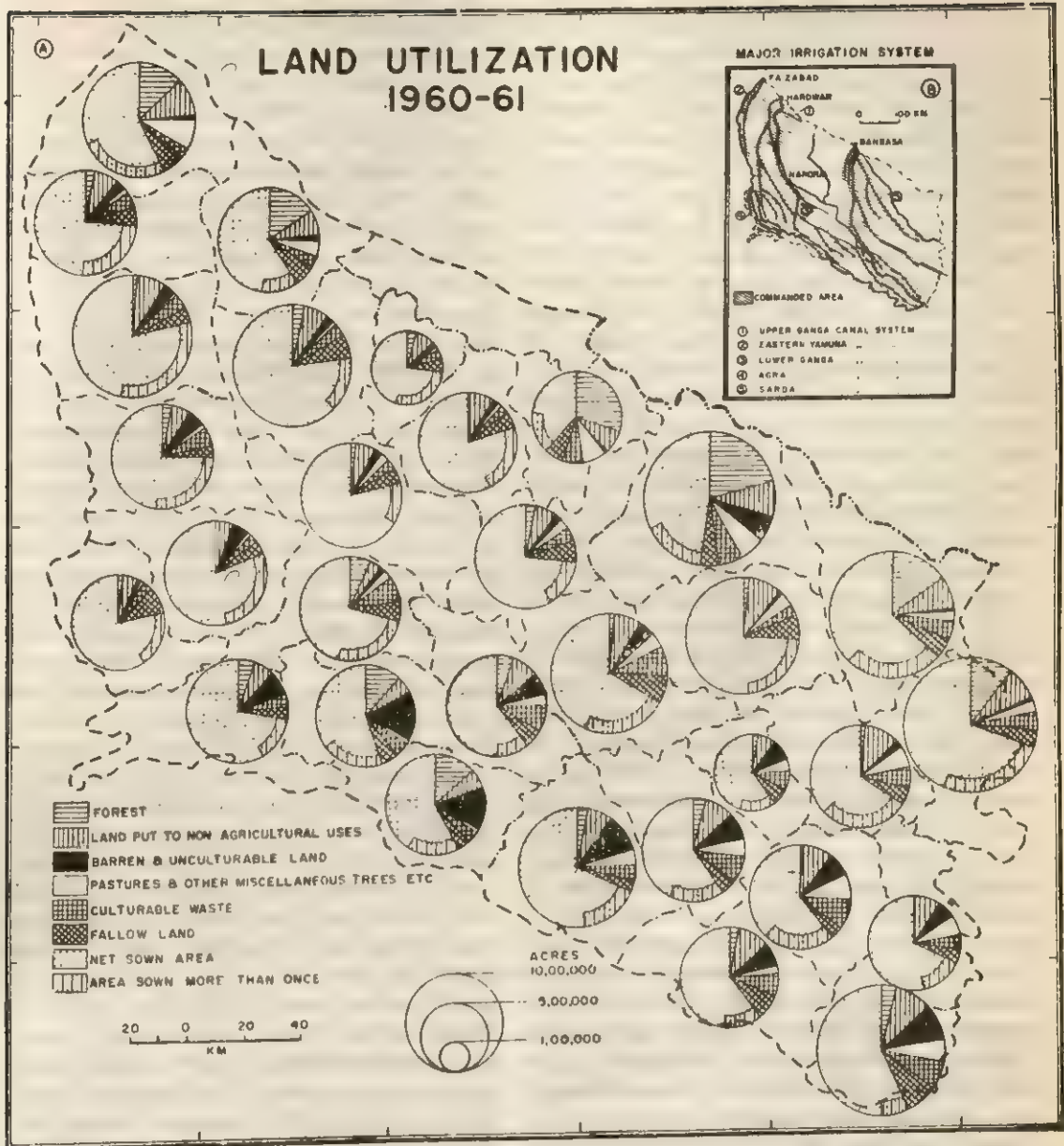


Fig. 4.19

Bahraich, as such, have the lowest percentages of irrigated land in U.P. The eastern fringe of the Awadh Plain is better irrigated as is evidenced by the district averages of Faizabad (49.3), Rae Bareilly (40.5), Sultanpur (39.6) and Pratapgarh (38.7).

Although surface wells, being cheap and handy, are the ubiquitous source of irrigation throughout the region, yet there are wide variations in the levels of dominance of various sources of irrigation in different sub-regions. In general, wells including tube-wells (47.2%) and canals

(39.5%) are by far the most important in the State, and unlike the Middle Ganga Plain, tanks, *jhils*, *tals* and other sources (13.3%) are less important here. In the Upper *Doab*, excepting Bulandshahr (43.1%), more than half to about three-fourths of the irrigation is done by canals while in the Lower *Doab* it varies between 1/2 (Fatehpur) to 1/4 (Allahabad). The highest percentages are found in the eastern-central *Doab* as evidenced by Kanpur (85.5%) and Etawah (84.2) figures. In the Upper *Doab* districts canals claim between 36.4% (Farrukhabad) and 68.7% (Muzaffarnagar), while in the Lower *Doab* it decreases from about 53% in Fatehpur to only 25.8% in Allahabad. In the Rohilkhand Plain, canals are important in the central and eastern parts irrigating as they do about 50% of Rampur to over 90% of Pilibhit, other districts falling in between, while in the *bhnr* tracts of the Western Rohilkhand Plain, wells and tube-wells dominate irrigating about 74% of the total irrigated in Bijnor and as much as 91.4% in Budaun and 92.1% in Moradabad; in fact, in the latter two districts, canals are negligible, although in Bijnor about 24% is canal irrigated. In Awadh Plain, canals are important and irrigate about 58.34% of the total irrigated; except in Kheri (27.02%) the canal irrigated proportion in different districts ranges between 50.69% (Rae Bareilly) to over 76% (Unnao). Budaun in Rohilkhand and Bahraich in the tarai of the Awadh Plain are conspicuous by the absence of canals.

The Upper Ganga Plain has extensive canal net-work developed meticulously over the last hundred years (Fig. 4.19b). The important systems in the *Doab* are the East Yamuna, the Upper Ganga and the Lower Ganga canals. The East Yamuna system claims to be rather one of the oldest irrigation projects in the country. It originates from the left bank of the Yamuna at Tajewala in the Faizabad *pargana* in the NW corner of Saharanpur district. The main and chief branches have a length of about 206 km while the distributaries run for over 5,000 km. It irrigates over half a million acres of area in the Yamuna-Hindan tract in the Upper *Doab* districts of Saharanpur, Muzaffarnagar and Meerut.

The Upper Ganga Canal (1853) takes out from the right bank of the Ganga at Hardwar where a dam is thrown across the river. The main channel and the principal branches have a total run for about 900 km irrigating over 2.4 million acres, mainly in Saharanpur, Muzaffarnagar, Meerut and Bulandshahr districts down to Mainpuri. The Deoband and Anupshahr branches are important. A 36m fall in the bed-slope of the canal from Hardwar to Aligarh is broken into 13 vertical falls of 2.4 to 3.6 m, seven of which have been utilized for generating electricity for about 2,000 tube-wells under the Ganga Valley Tubewell scheme. As mentioned above, these tube-wells provide water to the *bhnr* tracts of Bijnor and Moradabad and contiguous areas in western Rohilkhand, which are not amenable to canal irrigation. The Lower Ganga Canal (1872) takes off on the right bank of the Ganga at Narauna (Bulandshahr) by constructing a dam across the river. The main and principal branches run for over 1,000 km, while the distributaries are over 5,000 km. The system irrigates over one and a half million acres of Central and of Lower *Doab* in Aligarh, Etah, Etawah, Mainpuri, Farrukhabad, Kanpur, Fatehpur and right down to Allahabad district. The Sarda Canal, taken out from the Sarda at Banbasa in Naini Tal district, is the most extensive (12,267 km total length) system in the State, irrigating over 1.3 million acres in the Ganga-Ghaghara *Doab* region of the eastern Rohilkhand and Awadh Plain up to Rae Bareilly district and goes beyond to Azamgarh. The system was opened in 1928 and extended in 1941. The Sarda Sagar Project, set up on the Sarda in Pilibhit district, during the First Five Year Plan onwards, provides for irrigating about half a million acres of land. The Ramganga Multi-purpose Project which designs to construct an earth and rock-fill dam across the Ramganga near Kalagarh in Garhwal district, will provide irrigation facilities to 1.7 million acres in the central and western parts of Rohilkhand Plain. The works are to be completed in the Fourth Plan. In the Yamunapar tract, the Agra canal, emanating from the right bank of the Yamuna at Okhla near Delhi, forms

the main irrigation system and irrigates about 3.7 lakh acres. 58.1% and 82.9% of irrigated total in Agra and Mathura districts derive water from canals.

As noted above, wells including tube-wells still remain the most important source of irrigation. Moradabad (92.1%) and Budaun (96.4%), in the Western Rohilkhand Plain have the largest proportions of area irrigated by wells, which are also dominant in the contiguous Bijnor district (74%). Elsewhere in Rohilkhand as well as in western Awadh Plain, except in the less irrigated northern districts of Rampur (47%), Kheri (44.8%) and Bahraich (32.1%), well irrigation goes mostly below 30% ebbing to as low as 6.4% in Unnao, 6% in Pilibhit and 7.1% in Sitapur. In the Doab, wells and tube-wells still predominate in the Upper Doab districts of Bulandshahr (66.8%) and Aligarh (57%), and Lower Doab districts of Farrukhabad (58.9) and Allahabad (61.8), and are important in most other districts ranging over 30% except in Etawah (14.2) and Kanpur (10.6) which, as already referred to, are the overwhelmingly canal-dominated districts in the State, as is Mathura in the Yamunapar tract.

Tube-wells constitute a major source of irrigation in the western and central Rohilkhand Plain and Upper Doab. The *bhur* tracts of Bijnor, Moradabad, Budaun and Rampur, as well as Bareilly in the Rohilkhand, and vast tracts in Muzaffarnagar, Meerut and Bulandshahr in the Upper Doab, are extensively irrigated by tube-wells under the State Tube-well Scheme, linked with the Ganga Canal Hydroelectric Grid Scheme. As noted above, as many as seven falls in the bed-slope of the Upper Ganga Canal have been utilized as sites for generating electricity at Bahadurabad, Miragajni, Chitaura, Salawa, Bhola, Palra and Sumera. The transmission system of high tension lines runs for over 3,000 km in length and provides power for irrigational, residential and industrial purposes in the area. In the Awadh Plain surface and tube-wells irrigate about 27% of the total irrigated land, about one-third of which is shared by tube-wells; the latter are, however, gaining ground, and in Kheri dis-

trict they irrigate about 49% of the total irrigated area. In other districts, their share remains below 10% of the irrigated land.

Tanks, *jhils* and other sources of irrigation are conspicuous by their negligible share in the Upper Doab and Yamunapar tract (all districts below 1.5%), and are also unimportant in Lower Doab (all districts below 5%) except in Farrukhabad (5.8%) and Allahabad (12.4). In Rohilkhand Plain also they form unimportant sources, sharing below 5% except in Shahjahanpur (15.5%), Budaun (8.6) and Bareilly (5.8) where they gain some importance. In Awadh Plain these sources become important and irrigate about 15% of the irrigated total; their highest incidence is found in Bahraich (over 60%), followed by Gonda (33.4), Sitapur (20.6), Barabanki (16.6), Hardoi (15.9), Unnao (15.4), Rae Bareilly (12.2) and Lucknow (11.9). In Faizabad, Sultanpur and Pratapgarh they are of decreasing importance with the provision of other sources of more assured water supply.

Cropping Pattern : The region is more diversified in cropping than the Middle Ganga Plain. There is a very high premium on the food-crops, as usual, and over 85% of the total cropped area is devoted to such crops in the region.⁴² Cereals alone claim over 3/5ths of the cropped land and pulses about one-fifth, while about 8% is devoted to sugarcane, a crop which has almost replaced cotton in many districts and has reduced it to a mere 0.4% in the region. Oilseeds are next to sugarcane as cash crops and are of increasing importance in some tracts.

Wheat is the premier crop of the region, which places Uttar Pradesh in the first position by producing about 35% of the country's total. Over 1/5th of the total cropped land is devoted to wheat in the region as a whole but the districts of the Upper Doab and contiguous parts of the Western Rohilkhand Plain provide more than 1/4th of the cropped land to this prized crop. In fact, the cultivation of wheat replaces rice as one goes west where the fertile loamy soil, adequate and assured irrigation and the small but highly beneficial winter rain and suitable temperature regimes are significant factors for its regional dominance.

In terms of the percentage of net sown area under wheat cultivation, Moradabad district (34.9) leads and is closely followed by Meerut (34.2), Budaun (33.2) and Muzaffarnagar (33.1); in these districts wheat covers 46.9, 30.0, 55.7 and 28.2% respectively of the irrigated area. In the Central and Eastern Rohilkhand as well as in Central and Lower Doab and Awadh Plain, the proportion decreases. In fact, of the total cropped land only 1/7th to 1/6th is devoted to wheat in Sultanpur, Pratapgarh, Fatehpur, Allahabad and some other districts of the Awadh Plain and Lower Doab. In the dry Yamunapar tracts also wheat is important and claims 46.9 and 53.9% of the total irrigated area. Wheat, thus, takes the lead in over 2/3rds of the districts. Productivity per acre decreases as one goes eastward with a few exceptions. Eight districts in the West, i.e., Bulandshahr, Etawah, Mainpuri, Meerut, Agra, Aligarh, Farrukhabad and Mathura record high per acre yield (more than 10 maunds per acre as compared to 8.8 maunds as State average). The tarai districts (Bahraich 6.1 maunds) have lower yields (below 8.0 maunds), while others show medium productivity.

Rice, though the first crop in U. P., is second to wheat in this region and claims over 1/6th of the total cropped land. It is, however, an important crop in the humid sub-Himalayan tarai where the districts devote from 17.3% (Saharanpur) to 28.7% (Bahraich) and 32.0 (Pilibhit) of the cropped land, and which merges with the Eastern Awadh and Lower Doab belt where rice predominates—Faizabad (30.4), Gonda (32.5), Sultanpur (32.6), Pratapgarh (26.5), Rae Bareilly (28.6), Barabanki (29.4), Fatehpur (20.7) and Allahabad (24.3). The Central Awadh tract (12.0% in Hardoi to 10.0% in Lucknow), Central Doab (4.2 in Etah to 13.3 in Etawah) and SW Rohilkhand (Budaun 5.9 to Moradabad 12.1) also devote sizeable portion of the crop-land to rice, but in the Upper Doab (1.4% in Aligarh, 2.5 in Meerut to 7.6 in Muzaffarnagar and 8.8 in Bulandshahr) it is rather unimportant and in the dry Yamunapar tract (Mathura 0.5 and Agra 1.8) it is negligible. In per acre yield, however, it is the Doab, except Farrukhabad, which records

more than 8.5 maunds per acre as compared to the State average (6.8 maunds) while no district of the East U. P. Plain except Varanasi exceeds the State average. Thus, the yield per acre is inversely correlated with the extent of cultivation of rice.

Millets and maize together, as in the State itself, occupy third place in the region, claiming 16.8% of the total cropped land. Being hardier crops, millets gain importance in the drier west and south-west, particularly in the saline and alkaline soil zones with below 100 cm rainfall. Bajra is the most important millet claiming over 7% of the total crop land, and is particularly so in the south-western Plain where Bulandshahr (9.2), Aligarh (19.5), Mathura (14.5), Agra (24.7), Mainpuri (14.0), Etah (20.0), Budaun (18.0), Moradabad (9.5), and Etawah (16.7) form a compact zone. Elsewhere, except in Allahabad, it marks below the regional average and is particularly low in the tarai belt (0.2% in Bahraich and Gonda). Maize covers over 6% of the crop-land and forms a belt in the tarai region (Gonda 13.6, Bahraich 21.1, Kheri 8.9, Naini Tal 0.7% of the crop land). Some other districts of significance are Meerut (7.4), Bulandshahr (11.4) and Aligarh (8.1) in the Upper, and Mainpuri (7.5), Etah (9.2), Farrukhabad (10.9) and Etawah (6.0) in the Central Doab. Other districts in the central and south-western plain also grow sizeable amount of maize. Jowar gets less than 4% of the crop land and assumes importance only in dry Mathura (7.8%), from where the jowar belt starts towards Rajasthan, and the Central Lower Doab (Farrukhabad 9.1, Kanpur 12.5, Fatehpur 13.5 and Allahabad 5.5%), which merges into the famous jowar belt of the Vindhyan Hills and Plateau region towards south, and tapers into a rather compact narrow zone formed by Unnao (6.8%), Rae Bareilly (7.3), Lucknow (4.9), Hardoi (5.6), Shahjahanpur (4.5) and Bareilly (4.7).

Pulses and oilseeds are grown throughout as in U. P. as a whole, mostly interculturally. The region contributes highly in making U.P. the country's premier pulse and oilseed growing State. Several *kharif* (*urd*, *moong*, *arhar* and *moth*)

and *rabi* (gram, peas, and *masur*) crops consist of pulses which provide greater diversity to the cropping pattern of the region. Gram (12.0) and peas (4.6) together take about 1/6th of the total cropped land in the region and are close to rice in acreage. Gram is important in the Yamunapar tract (Mathura 16.7 and Agra 21.2%) and the East-Central Rohilkhand and contiguous Awadh Plain (Rampur 14.8, Bareilly 13.0, Shahjahanpur 13.3, Pilibhit 12.3, Sitapur 13.3, Hardoi 14.2, forming a contiguous block) along with other neighbouring districts like Fatehpur (23.2), Allahabad (16.4), Sultanpur (13.0), Faizabad (13.7), Kanpur (15.2), Etawah (14.2), Mainpuri (11.3) and Farrukhabad (11.9). Peas assume importance in the Upper and Central Doab districts of Meerut (6.7), Bulandshahr (10.5), Aligarh (12.7), Mainpuri (9.0), Etah (8.8) and Etawah (9.4) and also in Allahabad (5.6), Faizabad (10.7), Sultanpur (7.0), Pratapgarh (5.7) and Bahraich (6.7) in the east. *Arhar* is significant in Agra and Kanpur but is negligible in the *tarai* districts. *Masur*, on the other hand, attains prominence in the *tarai* districts from Bareilly to Gonda and in Shahjahanpur; Bahraich is at the top.

Among the several oilseeds, groundnut is the most important and is rather concentrated in a broad northwest-southeast belt from Moradabad district to Lucknow in the Upper Central part of the region. As it thrives well on light sandy soil not suitable for most other crops, it assumes great importance in the *bhur* tracts of Moradabad and Budaun and the sandy soils of Sitapur and Hardoi, which together account for about half of the groundnut area of the State. Mustard, next to groundnut in acreage, is more widespread, but forms two well-marked clusters, one from Mathura to Kanpur in the south and beyond the region in Jalaun and the other in the *tarai* districts of Kheri, Bahraich, Gonda and further east to Gorakhpur. Kanpur, Mathura and Bahraich are most important districts in order of acreage. Allahabad is important for linseed and the Yamunapar tract for *til*.

Sugarcane, cotton and jute are the commercial crops of the region; while cotton is fast decreas-

ing in importance, jute, a rather new entrant, is gaining ground. U. P. grows about 46% of the country's sugarcane, and the Upper Ganga Plain provides the bulk of it with 7.5% of the crop land under sugarcane as compared to 6% in U. P. As it requires deep fertile loamy soil and plenty of assured water supply, it forms an east-west belt in the north of the plain with important sub-regional clusterings in the (i) Upper Doab and Western Rohilkhand (Saharanpur 15.2, Muzaffarnagar 24.3, Meerut 20.5, Bulandshahr 13.0, Bijnor 16.0, Moradabad and Rampur each 11.5) and (ii) Central *tarai* and neighbouring districts (Naini Tal 10.6, Pilibhit 12.7, Kheri 13.8, Sitapur 6.4). There has been an extensive increase in sugarcane acreage during the last twenty years. Cotton is concentrated in the West Plain between Muzaffarnagar and Mathura, where, as compared to the State average of 0.3% and the regional average of 0.4%, each district devotes more than one percent of its crop land to cotton. Cotton acreages have been mostly switched over to sugarcane. Jute is confined to the more humid *tarai* districts of the region, particularly in Kheri and Bahraich and further in the East U.P. Plain.

Sugarcane is a predominant crop in the Upper Doab and contiguous area of the Rohilkhand Plain marking the highest productivity and accounts for more than 1/4th of the total value of agricultural produce. In Faizabad, Sultanpur and Bahraich, on the other hand, in the east, it is rice which contributes the major share. In the SW Doab wheat is predominant in most districts while coarse grains are important in Agra, Bahraich and Sitapur districts. Pulses in Etawah and Mainpuri in the Central Doab and oilseeds in the Eastern Rohilkhand and Western Awadh Plains with Hardoi on top are important.

Cropping Intensity : There is a wide variation in the cropping intensity at sub-regional and district levels. The cropping intensity index is higher in the Upper Doab and most of the districts of Awadh Plain, as compared to U.P. as a whole (125.1) and ranges between 144.1 (Faizabad) to 125.9 (Etawah). The Lower Doab excepting Allahabad (126.1), the Rohilkhand Plain

excepting Rampur (138.4) and Bareilly (126.4), and the Yamunapar tract have a lower incidence, the districts ranging between 112.9 (Farrukhabad) and 114.8 (Budaun). Bijnor, Moradabad and Budaun with large *bhur* tracts in the Western Rohilkhand Plain and the Yamunapar tract with large chunks under the ravines of the Yamuna have rather the lowest intensity in the Upper Ganga Plain.

The cropping intensity as also the per acre yield is the net result of various physical and cultural factors involved in the agricultural land use. The Upper Doab which has high cropping intensity index, for instance, has more extensive and dependable irrigational facilities on its predominantly loamy soil than the Lower Doab with relatively meagre irrigational facilities on its sandy loam, and, in parts, sandy soils. In fact, Upper Doab districts, excepting Saharanpur, have about 60% of their net sown area under irrigation and hence the higher proportion of land devoted to double or multiple cropping there. Irrigation, in fact, has a direct bearing on cropping intensity in most parts; in the Yamunapar tract, the irrigated area is below 45%, and the double or multiple cropped area is below 21%. Likewise, in the districts of Etawah, Mainpuri, Farrukhabad and Etah in the SW part of the Central Doab less than 45% of the sown area is irrigated and the double or multiple cropping varies between 23 to 31%. In the Lower Doab, i.e., Kanpur, Fatehpur and Allahabad, less than one-third of the net sown area gets irrigational water and cropping intensity index marks below 126. Faizabad district of Awadh Plain, irrigating over 50% of its net sown land, enjoys high index (over 144). Most of the Rohilkhand Plain, with less than 15% of the net sown area under irrigation, marks low intensity, though the tarai districts like Bareilly with higher rainfall and more moist climate are exceptions to this generalization.

The agricultural intensity measured in terms of such productivity index as per acre yield shows also interesting distribution pattern in the region. A highly productive compact area with per acre output exceeding Rs. 200/- (U.P. average

Rs. 166) has developed in the Upper Doab and the contiguous district of Bijnor of western Rohilkhand Plain, Muzaffarnagar (315) and Meerut (304) districts are at the top. In fact, the entire western two-third of the region marks higher productivity than the State average with the exceptions of Mathura, Aligarh, Etah, Mainpuri and Budaun districts. In the eastern part of the region only Barabanki (177) and Faizabad (168) show a higher yield.

Apart from the physical properties of the land and irrigation facilities and type of crops grown, the size of the holdings, the type and quality of implements used on the farm and labour input are also important factors affecting the per acre yield or general productivity. Barring few exceptions, the average size of the agricultural holding increases from the east to the west. All the westernmost districts and most of those in the sub-Himalayan belt of the West Plain enjoy generally larger holdings than the State average (5.0 acres in 1961). Excepting Kanpur (5.6) and Fatehpur (5.5), most of Awadh Plain (Fig. 4.20), Central Rohilkhand and Central Doab and Allahabad district in the Lower Doab, have below the State average, ranging between 3 and 5 acres. "However, if the holdings are analysed in terms of quartiles in the Upper Doab, a quarter of the holdings are below the size of 0.8 acre, half of the holdings are below 1.6 acres and only 25 per cent exceed the 10-acre size".⁴⁸ Various expertize estimates put the size of economic holdings between 6 and 10 acres in the plain region. Thus, majority of the holdings in the region are uneconomic and far below the optimal size for a good standard of farm living. The picture is rather very gloomy if one looks at the per capita rural agricultural holding : excepting Saharanpur, Kanpur and Fatehpur all having 0.8 acre, the entire Doab has an incidence of 0.7 acre, while the Rohilkhand Plain, western Awadh and the *tarai* districts and the Yamunapar tract range between 0.8 and 1.0 acre (Shahjahanpur). Thus, the pressure of population is intense. The uneconomic size of the holdings partly explains the difficulty in the mechanization of agriculture. In 1961, the area under tractors as percentage to

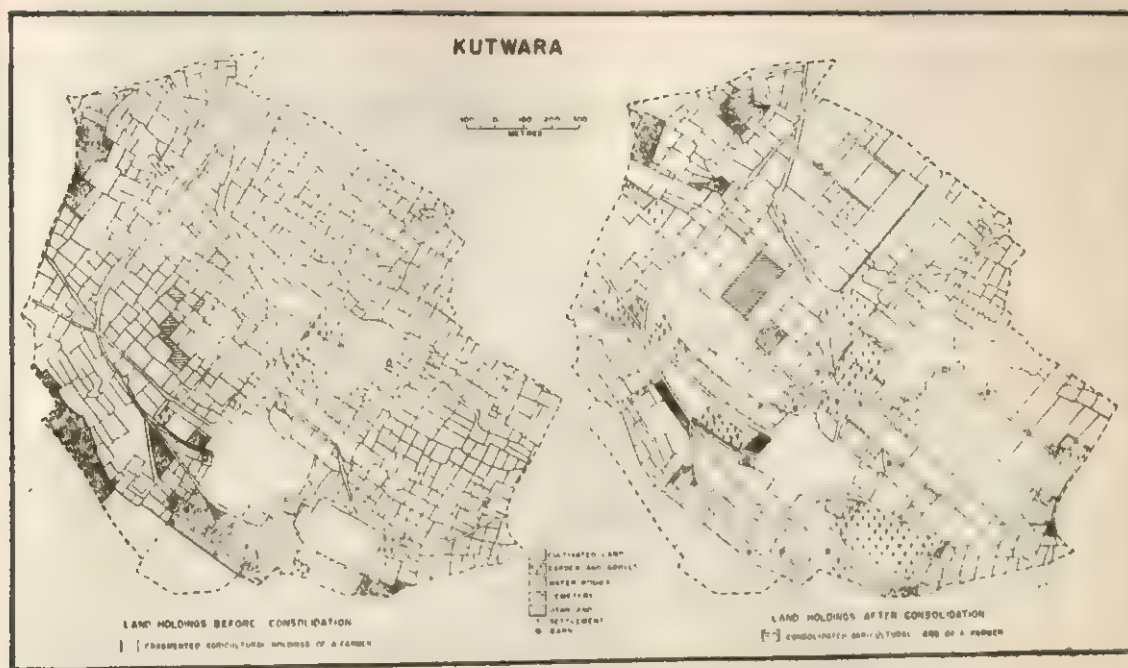


Fig. 4.20

the net cultivated area was only about 4% in the Upper Doab, a very low percentage indeed. The Upper Doab districts and parts of the western *tarai* have more tractors, use more fertilizers and the HYV seeds and adopt other improved practices of modern farming. It may be remarked that since the establishment of the Pantnagar Agricultural University, Rudrapur, the development and diffusion of the HYV seeds and modern farming techniques have boosted up agricultural production in the region. Of about 40,000 tons of fertilizers used in the Doab in 1961, as much as 45% was utilized in the four districts of the Upper Doab and the rest by ten district. Likewise, of the total area under Japanese method of rice cultivation in the Doab, nearly half lay in the Upper Doab districts alone.

Thus, the Upper Ganga-Yamuna Doab is a prosperous agricultural area where the level terrain, deep and rich soil of the *bhangar* upland, high water-table, 60-90 cm rainfall, compensated by wide spread canal and well irrigation system, providing security against monsoonal vagaries,

increasing urbanization, increasing trend towards cash cropping and adoption of the modern farming practices lead to high agricultural output per cultivating household or more earning per cultivator. The hardy and efficient Jats are an asset to the regional agriculture and once given, they aggressively take to innovations. It is not surprising to find that, other things being equal, the areas with jat concentrations have the highest percentage acreage under double cropping.

Crop Combination : Wheat, rice, bajra and gram are the four crops in order of importance in coverage which form the premier crops in exclusively different parts of the region (Fig. 4.21) : wheat dominates in the Upper Doab, Mathura district of the Yamunapar tract, western and southwestern Rohilkhand Plain, Western Awadh and Kanpur district, while rice is the first crop over the submontane and contiguous Rohilkhand and Awadh districts north of the wheat belt, running all through the eastern Awadh and Allahabad district in Lower Doab. Bajra claims first position in Aligarh, Agra and Etawah in the

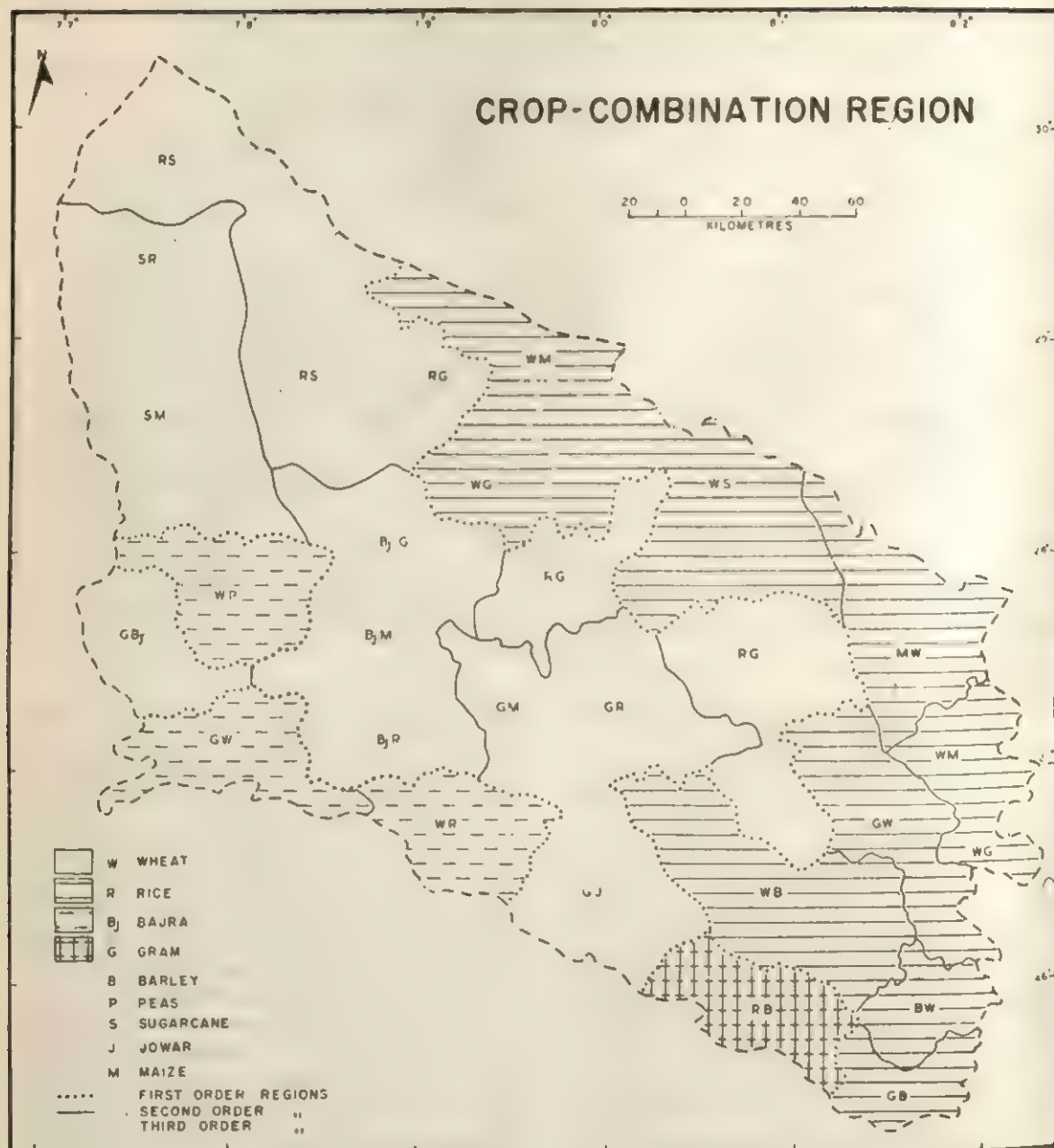


Fig. 4.21

SW while gram becomes dominating in Fatchpur district. It is clear that all these four premier crops take their respective spatial positions in the region as part of their more dominating belt in their contiguous areas; for instance, wheat

dominates in the Punjab Plain in the west, millets in the south and SW, in M.P. and Rajasthan, gram in the Vindhyan Hills and Plateau region in the south and rice in the rice belt of the Middle Ganga Valley.

In the wheat belt rice is the second crop in the more humid north and east followed by sugarcane in the irrigated west and gram in the east. Throughout the central-southern part of the Upper Doab (Muzaffarnagar to Bulandshahr) with high supplemental irrigation sugarcane assumes the second position while the same position is taken by rice in its northern (Muzaffarnagar) and maize in the southern part. *Bajra* dents into second position to wheat from Budaun to Mainpuri, followed by gram, maize and rice from north to south. To the east is gram as the second crop covering Farrukhabad, Hardoi and Kanpur districts where maize, rice and jowar take the third positions respectively.

In the rice zone, over most of the submontane region wheat is the second crop, followed by maize in the NW, gram towards south and sugarcane in the east (Kheri district); in eastern and South-Central Awadh maize and wheat in the north (Bahraich), alternating their position in the contiguous area to the south-east, and gram and wheat alternating with each other in Barabanki and Faizabad respectively take the next ranks while wheat and barley alternate in Unnao and Rae Bareilly on the one hand and Pratapgarh district on the other. In Allahabad gram and barley take second and third position to rice.

In the *Bajra*-dominating area of the SW, wheat and peas in Aligarh, gram and wheat in Agra and wheat and rice in Etawah assume the next two positions respectively, while the gram domination in Fatehpur is followed by rice and barley.

Industrial Economy

The Upper Ganga Plain, though industrially not very important in the country, is comparatively more industrialized than the Middle Ganga Plain or the East U. P. Plain. Out of the 16 districts in U.P. with higher proportion of industrial workers than the State average (9.1), as many as 12 districts fall in this region in a block from Saharanpur to Agra and Bijnoor, Moradabad and Bareilly in the west and Kanpur and Lucknow districts in the east. Meerut (22.5%), Agra (19.3), and Kanpur (18.7) districts are at the top. Other districts in the Central and Lower Doab or most of Rohilkhand and Awadh Plain range

between 5 and 10%; Budaun, Kheri and Bahraich record below 5%.

Household industries have a greater importance everywhere except in the five districts in the State—Kanpur (75.3%), Lucknow (70.7), Agra (66.4), Rampur (61.5) and Bareilly (53.4) where manufacturing other than the household records the highest percentage of the total industrial workers. Of the State's 240,832 factories and workshops in 1961, 92.3% are of small size, engaging less than 6 workers while another 6.7% employ 6 to 19 workers each. This works out to only one percent of the factories employing 20 or more persons. Of the six districts having more than 2% of the total number of factories and workshops employing 20 or more workers, five—Agra, Aligarh, Kanpur, Muzaffarnagar and Bulandshahr are in this region, only Gorakhpur being outside it. Agra (78), Kanpur (55) and Meerut (40) districts have the greatest number of factories with 100 workers or more (Fig. 4.22).

U. P. is, by far, the largest single producer of sugar in the country, and the bulk of the production comes from the Upper Ganga Plain. Of the State's 71 factories employing about 55,000 workers, 43 are in this region with about 40,000 workers. The factories in this region are, in general, bigger in size and as many as 14 units with more than 1,000 workers each are found here, while there are only two such units in the East U. P. Plain with 28 factories. All the factories except one each at Neoli (Etah), Kanpur and Burhwal (Barabanki) are located (i) in the sugarcane belt of the Upper Doab from Saharanpur to Bulandshahr with continuation through the Rohilkhand Plain, the *tarai* zone of Pilibhit-Bareilly, and (ii) around Kheri-Bahraich-Hardoi, further merging into the Eastern U. P. sugar belt. Meerut district has 8 units and Muzaffarnagar 4, but the latter are larger, each employing more than 988 workers. The second largest unit in the State is at Mansurpur (1,875 workers) in Muzaffarnagar district, the first being at Pilibhit (1,941). The profitability index is also higher in this region than in East U. P. and the units are less sickly also. They economize also more by developing bye-product industries : of the State's 16 units

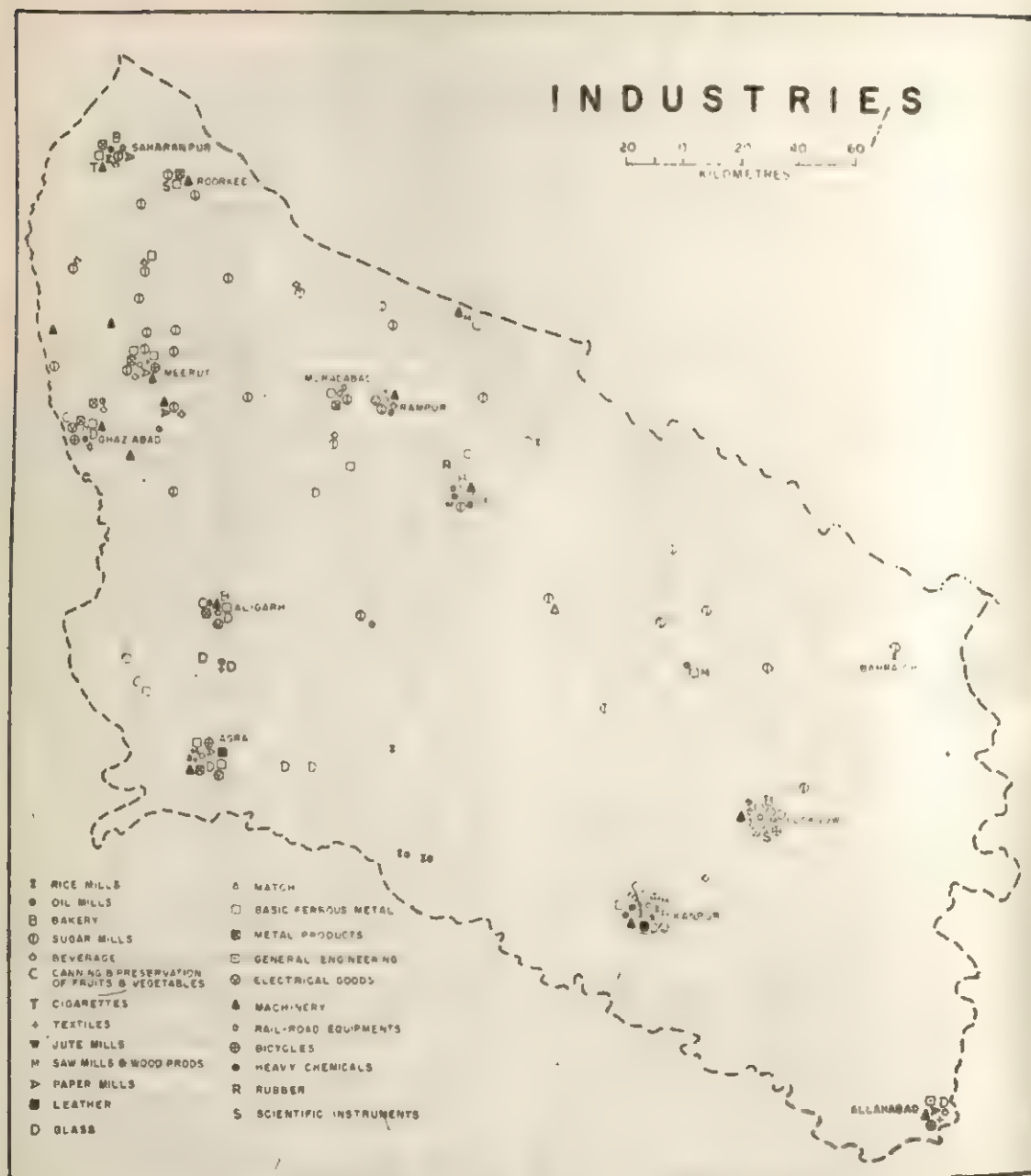


Fig. 4.22

(1,521 workers) engaged in distilling, rectifying and blending of spirit, all but three are located in this region and most of the distilleries are attached to the sugar mills, using their molasses. The

largest distillery is, however, outside the sugar-belt at Lucknow (344 workers). There is one wine-making unit at Rampur (103) and one of soft drinks at Kanpur.

Other food-processing industries include rice, *dal* and edible oil mills, bakeries and confectionery, fruit processing, dairy and hydrogenated oil units. They are mostly very small in size and are located both in large and small centres, mostly in the Doab with Kanpur, Allahabad, Etawah, Aligarh, Hathras, Ghaziabad and Meerut as most important centres, while outside this region Lucknow, Bahraich, Shahjahanpur, Bareilly and Rampur are also notable. Peculiarly enough, vast majority of U.P.'s 141 rice mills (2,518) are located in this region instead of the rice-dominated East U. P. Plain; the largest number is in Bahraich (21) followed by Mainpuri (13) and Etawah (12). Most of the rice mills are centred in small market towns. Similarly most of the State's 104 *dal* mills are located in this region. Kanpur (288) has the maximum employees in its 15 mills while the largest number (22) of mills are located at Hathras (273). Aligarh district has, in fact, more than 1/3rd of the State's *dal* mills. Kanpur also leads in the edible oil industry, employing in its 19 mills about 25% of the total workers in the State's 100 mills. Other notable centres are Agra (883), Aligarh (628) and Hathras (381). All the four factories of U. P. producing hydrogenated oils are located in this region—two at Ghaziabad (490) and one each at Modinagar (488) and Kanpur (335). Bakery and sugar confectionery is centred mainly at Kanpur while Aligarh and Saharanpur are other centres. Thus, most of the food-processing factory units are located in the SW part of the region, mostly in the Doab from Meerut to Kanpur. Kanpur enjoys the premier position having factories of all categories.

Textile industries comprising cotton, woollen, jute, silk and others are the largest single industrial group, both in terms of employment and industrial output in the region as also in U. P. as a whole. Cotton group is by far the largest. Kanpur, which is advantageously located between the Bihar coal and Punjab Plain and Malwa plateau cotton sources, has 14 large cotton factories which, by employing 2/3rds of the State's 62,000 cotton workers, make it virtually the cottonopolis of N. India. Kanpur's industrial

growth has been sudden and fast : the first cotton mills were established between 1869 and 1882 after it had become a great cotton trading centre from the days of the American Civil War which provided stimulus for the Indian cotton trade. The city specializes in the manufacture of tent canvas and other types of cloth. Modinagar (4,800 workers), Hathras (3,100), Rampur (2,200), Saharanpur (1,800), Agra (1,200) and Allahabad (1,000) are other important cotton textile centres in the region. Of the State's 14 woollen textile factories, employing over 3,300 workers, 8 are located in this region, and Kanpur is the leading centre with about 2/3rds of the State's total workers in this group in its two large factories. Agra, Meerut, Najibabad (Bijnor) and Allahabad are other centres. Of U. P.'s three jute mills (4,550 workers), two largest units are located at Kanpur (3,500). However, there is only one small silk textile unit at Kanpur, most others being at Varanasi and Dehradun outside the region. Kanpur, however, is the largest knitting centre, employing over 65% of 735 workers in the State in this group, and has also all the two units of the State, producing wearing apparel. Ghaziabad has one cordage and twine factory (200 workers).

Kanpur and Agra are world famous leather and leather goods centres, and the former employs about 4/5ths of the total workers (7,683) engaged in the State, in this group. Of the 47 shoe factories of U. P., 9 large units (over, 3,000 workers) are centred at Kanpur and 37 (1,159) at Agra. Majority of the tanneries (24 out of 31 in U. P.) are located at Kanpur employing 2,964 of the States' workers (3,237), Agra, Unnao, Mohammadabad (Farrukhabad) and Fatehpur are other tannery centres. Meerut is also an important leather goods centre.

All the paper and pulp industry units of U. P. are located in this region. Saharanpur (1,052), and Lucknow (509) paper mills employ about 60% of the total workers in the State in this group. Paper is also manufactured at Pilkhuwa (Meerut), while Meerut (500), Saharanpur (166), Kanpur (133) and Allahabad prepare paper-board and straw board. Saw-milling units are concen-

trated in Lucknow district and a notable centres are Clutterbuck, in Bareilly, Saharanpur and Hardwar. Nearly 1.5% of the State's plywood unit is the output of the State's plywood units. Sawmills are located at Najibabad (Bijnor) and Jwalapur (Saharanpur). Two government-owned wood-working institutes at Bareilly (317) and Allahabad (241) create 8% of the total workers in the manufacture of wood products in the State.

As the region like most of the State lacks in the mineral resources of any significance, any heavy metallurgical or mineral-based industry could not be developed excepting some units using imported materials. Of over 350 units of metal-based industries employing about 15,000 workers, more than 300 are located in the Upper Ganges Plain. Basic ferrous metal industries form the largest group, employing about half of the total workers, and Kanpur is the chief centre engaging 1/3rd of the State's workers in this group. Out of 127 units, over 7,000 workers turning ferrous metals, 177 units of iron and steel at Agra and Kanpur with the Kanpur rolling mills employ over 3,000 workers.

Kanpur, Bareilly, Lucknow, Rampur and Ghazipur are the main agro-cultural implements, while Agra and Kanpur turn out machine tools, wood-working machinery and other tools. Kanpur also manufactures textile machinery and accessories and a few other machines. Cotton and jute spinning industry is more widespread, the important centres being Lucknow, Kanpur, Meerut and Gorakhpur with about 1/3rd of the workers in the industry. Kanpur, Bareilly, Agra and Gorakhpur prepare fans, radiators and other electrical goods and accessories, and insulated wires and cables are made at the latter two. Agra, Gorakhpur, Mathura, Agra and Kanpur. Recently the Heavy Electricals has been established at Haridwar. Kanpur has about half of the State's machine manufacturing units, though Meerut and Ghazipur are the biggest. The machine tools are mostly of Indian origin, but at Lucknow, Kanpur and Agra as that of Clutterbuck are big units each employing more than 3,000 workers. Kanpur has become a large mechanical engineering centre. Aeroplanes are

reported at Lucknow and Allahabad. There are a number of workshops of the Government Roadways and private workshops for repairing buses, trucks, cars etc.

All the 8 factories of U. P. producing heavy chemicals are located in this region (Kanpur 7, and Ghazipur 1). There is one sulphuric acid and resin manufacturing unit (over 500 workers) and another of matches (1,200) at Clutterbuck near Bareilly. Fertilizers are produced at Kanpur, Moradabad, and at some other smaller centres. About half of the State's 31, fine and pharmaceutical chemical units are concentrated at Lucknow (19) and Kanpur (5), but the larger unit is at Jwalapur near Haridwar (Saharanpur). Meerut, Agra and Kanpur manufacture rubber goods. The Government Precision Instruments Plant at Lucknow alone engages 1/3rd of the State's total workers in scientific instruments industry. Roorkee (Saharanpur) is also an important centre.

The region is famous for cottage and small scale industries. Its handicrafts have been known anciently in the International market. These industries, no doubt, have some inherent drawbacks, particularly lack of standardization, but that is their strength also in providing for the individual taste and skill. Many of the industries have remarkably sustained and withstood the adversities of the last two hundred years of competition with the machine-made goods, and in fact with the State help and expansion in the West, some have been improving their position, mainly those which have a 'special advantage' in the production of these goods where intricacy of designs and fine art are essential to the quality. Moreover, they are capable of absorbing the rural manpower in the off seasons and stabilizing the agricultural society with profits without pushing off the workers to the wilderness of the overcrowded urban areas.

Handloom weaving is the most important cottage industry and it makes a variety of different very coarse country cloth or simple handloom cloth, its goods and prices being largely seasonal. It also weaves embroidered and fine cloth and coarse fabrics. Etawah and Sandila are famous for the

500 km. The marshy nature of the tarai and its slower pace of development are responsible for low density.

There is enormously heavy traffic density on trunk roads and on such other roads which run parallel to the railways. There is intense competition between railways and such roads, the latter providing quicker, cheaper, more frequent, and moreover, highly flexible services to the movement of agricultural goods and raw materials. Motor vehicles render services, if necessary, from door to door, on difficult gradients or poor roads. There are feeder roads to railways and trunk roads, but the complementarity net is not adequate so far.

The Upper Doab region has the highest density of both passenger and freight traffic where Meerut, Agra and Delhi (though outside the region) are the principal foci. Delhi-Meerut route bears highest traffic density, specially on the National Highways linking Delhi to Dehra Dun, Garhmukteshwar and Bulandshahr, and has the greatest number of daily bus-originating centres (Meerut 451, Muzaffarnagar 221, Saharanpur 295, Dehra Dun 227, Bulandshahr 264 and several others with more than 50). Agra originates 352 buses. In this entire region north to south flow is predominant. The Central region, involving the vast uplands of Kanpur and Lucknow, ranks next to Meerut region in terms of power-driven traffic which is, however, restricted to its northern and southern margins.

In the Rohilkhand and northern tarai region, passenger traffic is more prominent on Budaun-Moradabad and Kathgodam-Naini Tal roads, while Bareilly-Naini Tal, Moradabad-Nagla and Bareilly-Pilibhit roads carry high freight traffic density. This region has a feeble link with its neighbouring regions through the only trunk road that traverses this region, joining Delhi and Lucknow via Bareilly.

The principal cities like Kanpur, Lucknow, Agra and Allahabad are on the internal air routes of the country. However, the region is close to the Palam International airport and there is a proposal to develop another international airport near Ghaziabad in this region.

The Regions

It is needless to emphasize the role of the Ganga in recognising the individuality of the region as the Upper Ganga Plain, being differentiated from the rest of the Ganga Plain on the physico-cultural basis. The region can be further subdivided into the regions of first order taking the Ganga as the dividing line, namely, the Upper Ganga Plain North and the Upper Ganga Plain South (Fig. 4.24). These two regions show significant variations both physical and cultural. Owing to its northerly location the influence of the Himalaya is felt over a considerably larger part in the former than in the latter. In the case of the former, the rainfall decreases from north to south, the tarai conditions prevailing over a considerably larger part; while in case of the latter, except in the extreme northern margin, the rainfall elsewhere decreases westwards, and the Peninsular streams, particularly south of the Yamuna have carved-out ravines and gullies. Culturally also, the Ganga has served as barrier to cause differentiation in the nature of human occupancy in the two regions. One wave of the Aryan migration swept most of the Ganga Yamuna Doab and another in a relatively more diffused form extended over the Awadh-Rohilkhand Plain. Other distributional features are noticeable in respect to density of population, trends of urbanization, nature of crops and industrial activities. The Upper Ganga Plain North is relatively less densely populated (about 275 per km²). In the Upper Ganga Plain North about 12% population lives in the towns while that in the Upper Ganga Plain South it is more than one fifth (21.4%). Likewise, rice is much more important in the former though wheat is the first ranking crop in both. Moreover, the Upper Ganga Plain North (below 3% industrial population) is much less industrialized than the Upper Ganga Plain South (8%).

The Upper Ganga Plain North is further divided into two second order regions—the Rohilkhand Plain and the Awadh Plain, and into seven third order regions—(i) Rohilkhand Tarai (ii) Rohilkhand Plain West (Moradabad Plain) (iii) Rohilkhand Plain East (Bareilly Plain), (iv) Awadh Tarai,

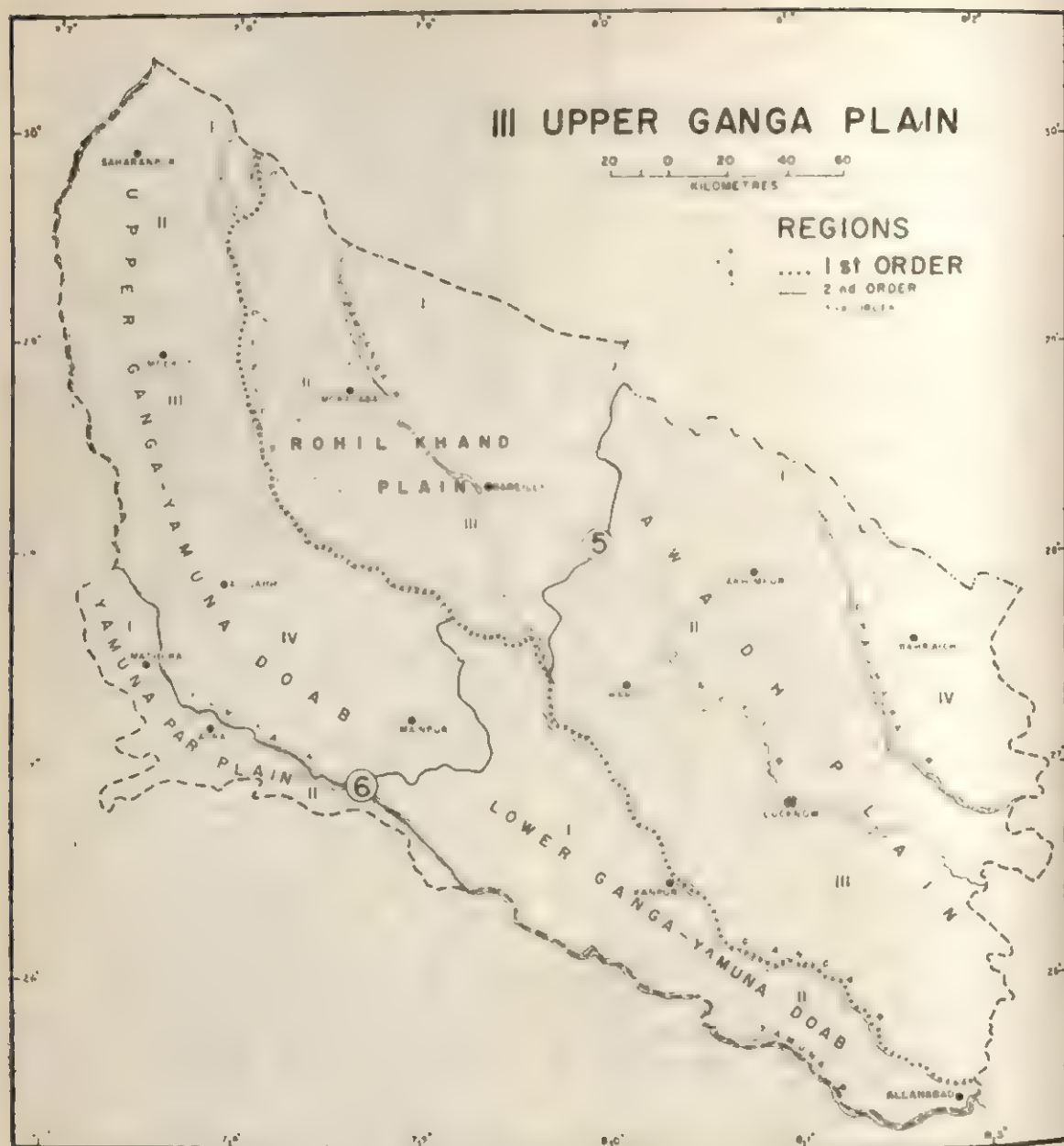


Fig. 4.24

(v) Awadh Plain North (Hardoi-Lakhimpur Plain) and (vi) Awadh Plain South (Lucknow Plain) and (vii) Saryupar Plain of Awadh (Bahraich Plain). No doubt, the association of Rohillas and ancient Awadh is a distinct factor in the

recognition of two second order regions. The Rohilkhand may be considered mostly as the plain of the Ramganga which flows through its heart, while the Awadh is marked by the influence of the Ghaghra and the Gomati. Moreover,

the tarai is more extensive in the Rohilkhand as compared to Awadh. Though both Awadh (270 per km²) and Rohilkhand (283 km²) show almost the same density of population, Rohilkhand is much more urbanized (about 17%) than the Awadh (9.5%). While wheat is first crop in Rohilkhand, Awadh has rice. Industrially also Awadh has less proportion of population engaged in industry (2.4%) than Rohilkhand (3.34%).

The third order divisions of Rohilkhand are also distinct. The tarai in the north is quite extensive and presents well-marked variations in physical as well as cultural features. Owing mainly to climatic conditions, it is relatively much less densely populated with 143 persons per km² as compared to Rohilkhand West (335 per km²) and Rohilkhand East (309). The tarai is also distinguished by its higher urban proportion (20.6%) and industrial percentage (4.9%). It appears that this pioneer fringe region has witnessed considerable development during the present century. There are significant differences between western and eastern sections of the Rohilkhand Plain also. The western section is relatively more densely peopled (335 per km²) than the eastern section (309 per km²) and is also relatively more urbanized and industrialized. Agriculturally, the eastern section has more rice while the western section has more wheat. Bareilly has emerged as a dominating regional centre with adequate industrial concentration and as such the eastern section may also be designated as Bareilly Plain. In the western section, Moradabad, though not as important as Bareilly, as a regional centre, is significant enough to associate the region and be known as the Moradabad Plain.

The Awadh Plain is among the most important micro-regions of the Great Plains. In spite of its homogeneity in relief, hydrography, climate, soil, etc., leading to uniformity in human activity and features of cultural landscape, different parts of the region exhibit their distinct geographical individuality based upon the diverse areal associations of the local elements of natural as well as human factors. The tarai here is quite distinct not only from the other three third order regions of Awadh but also from its counterpart

in Rohilkhand in respect to urban development with less than 3% people living in towns. It may further be remarked that the Awadh tarai is still rather a pioneer fringe from the point of view of human occupation. The remaining three regions of third order in Awadh show amongst themselves slight variations in respect to density of population, trend of urbanization and industrial developments. However, Awadh Plain South is quite distinct amongst the three with relatively much higher density of population (335 per km²): 11.1% urban population and 2.7% of industrial population. Lucknow, the capital city of U. P., seems to have influenced the pattern of growth here considerably and as such it may be called Lucknow Plain. Awadh Plain North (228 per km²) is less densely peopled than the Saryupar Plain of Awadh (255). The former is, however, somewhat more urbanised (8.9%) than the latter (7.2%). In the former there are two important urban centres, Hardoi and Lakhimpur and they do exert their influence and as such this region may also be distinguished as Hardoi-Lakhimpur region. Wheat is more important here, while in the Saryupar Plain rice is a dominant crop. In the Saryupar, Bahraich by its isolated location does exercise its regional influence over the whole region east of the Saryu, and it can aptly be called the Bahraich Plain.

The Upper Ganga Plain South is divided into three second order regions 1. The Ganga-Yamuna Doab (The Doab) Upper, 2. The Doab Lower and 3. The Yamunapar Plain, and 8 third order regions—(i) Ghar region, (ii) Saharanpur region, (iii) Meerut region and (iv) Aligarh region (all in the Upper Ganga Doab); (v) Mathura Plain (Braj Plain) and (vi) Agra Plain (in Yamunapar Plain); and (vii) Kanpur Plain and (viii) Allahabad Plain (in the Lower Doab).

The Yamunapar Plain is quite distinct from the Doab as a whole because of its location as a part of the Peninsular foreland. The Rajasthan desert tends to project its influence in this region and most of it is relatively drier (less than 60 cm rainfall). Millets, particularly *bajra* is much more dominant here. The density of population in the Yamunapar Plain is somewhat higher as compared

to the Doab mainly because of the urban influence of Agra and Mathura; and this is also more urbanized (31.4%) than the Upper Doab (18.1%) and the Lower Doab (20.6%). However, it is industrially least developed having as it does only about 2% of population engaged in industry, while in the Upper Doab about 7% population is engaged in industry and in the Lower Doab a little over 5%.

The Upper Doab is divided into four third order regions. The *Ghar* is more or less comparable to the tarai and it is the least densely settled region in the whole of the Upper Ganga Plain, mainly because of its physiographic and climatic conditions, and particularly there is no town of note.

The Meerut region at the third order level is the most densely settled (403 persons per km²). It exercises considerable influence over the region as a dominant regional centre, being itself influenced by Delhi metropolis. The Saharanpur region is somewhat more densely peopled than the Aligarh region (322 persons per km²) but the former is slightly less urbanised (7.8%) than the latter (18.2%) and has also less industrial activity with 5.3% population engaged in industry than the latter (8.3%).

The Mathura region is typically a part of the Braj with its ancient background of pastoral economy. It is much less densely peopled (277 persons per km²) than the Agra region (386 persons per km²) and it is somewhat less urbanised (29.6%) than the latter (32.1%). Wheat is the first ranking crop followed by gram and *bajra* while in the Agra region *bajra* is the first ranking crop and wheat, the third. Industrially both the regions are almost similar.

The Lower Doab is divided into two third order regions, one dominated by Kanpur and the other, by Allahabad. Though the Kanpur region (324 persons per km²) is somewhat less densely peopled than the Allahabad region (351) it is more urbanized particularly due to the impact of Kanpur (25.1%), the largest city of U. P., than the Allahabad Region (22.4%). It is striking that Allahabad region has relatively higher proportion of industrial population (6.7%) than the Kanpur region (4.3%). Agriculturally also the

Kanpur region has wheat as the first ranking crop while the Allahabad region, in most part, has either rice or gram as the first ranking crop; while gram and millets are next important crops in the Kanpur region; in Allahabad region barley prevails as the next crop.

It is possible to distinguish further lower order regions in the Upper Ganga Plain based on both physical and cultural factors, such as *Tarbar* in the Ghaghara valley and the *Khadar* in the Ganga and Yamuna valleys; these areas are subject to annual inundation and as such often give only one crop, that is the *rabi* crop. Likewise, the *Bhur* lands, marked by sandy ridges, particularly in the Ganga and Ramganga valleys, are quite distinct, both in respect to landuse and settlements from the surrounding regions. Further, an industrial ribbon is growing fast along the Delhi-Ghaziabad-Meerut road. It is, however, not possible to delineate and characterise these micro-regions within the scope of the present work.

Problems and Prospects

Though the Upper Ganga Plain is relatively more developed than the Middle Ganga Plain, it has its own problems, and there is considerable scope for further economic development. Moreover, within the region there is much disparity in respect to economic development, the Upper Doab being the most developed and the Awadhi tarai the least.

The land being the chief resource has been subject to misuses which have resulted into several land and associated problems. For instance, over-grazing and deforestation in most areas have led to soil erosion and ravine formation on the one hand and have accentuated flooding on the other. The Yamunapar region, for example, has been subjected to severe ravine-formation, particularly by the Yamuna and the Chambal. The traditional pastoralism of the Braj Plain, a critical rainfall zone, could not maintain the ecosystem partly due to overgrazing and partly to the encroachment of desertic condition. Likewise, the vigorous activity in recent years in the use of the Tarai resources, if allowed to proceed uncontrolled, may accentuate the processes of

flood, water-logging and soil erosion, leading to imbalance in the eco-system. Similarly, the over-exploitation of ground water resources without properly harnessing the rain water by storing it in village ponds and *tals* on extensive scale, cannot but lead to water scarcity which will be so suicidal to the agrarian economy of the region. Under the tempo of the Green Revolution and Land Hunger the practice of balanced land use cannot be ignored. To maintain eco-balance the sub-marginal and wastelands should be developed as pasture and woodlands at the village level.

As evidenced by the high productivity and agricultural prosperity of the Upper Doab, the rest of the region can be put on the same level of economic development provided water, elec-

tricity and road facilities be made available to that effect. There is good scope for further crop diversification and introduction of new crops like soyabean in the region for higher agricultural productivity. The region has a traditional fund of skill for arts and crafts which could be capitalized for developing the industries and improving their marketability through standardisation of the products. Through this, attempt should be made towards greater rural-urban integration which will involve the development of rural central places as local nerve centres. In the general transport net there is need for a submontane road traversing west to east up to Bahraich and beyond with a provision for transverse links to the Himalaya.

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Though not a clear-cut physical unit, the Middle Ganga Plain (24°30' N-27°50' N and 81°47' E-87°50' E) is a large physical area (144,409 km²), and it is the immense human, cultural and economic significance that makes it the heart region of India. It covers the Bihar Plains and Eastern Uttar Pradesh (mostly Purbia Plain) in their entirety, lying on either side of the Ganga and the Saryu (Ghaghara) within the Himalayan and the Peninsular ramparts on the north and south res-

pectively (Fig. 5.1). The western and eastern sides of the region are wide open forming as it does, the central part of the east-west continuum of the vast isotropic Ganga Plain—there is no physical boundary as the plain imperceptibly opens up in the west from out of the Upper Ganga Plain and so invisibly dies out into the Lower Ganga Plain in the east. As such, it is a transitional region, *par excellence*, interposed in the enormity of the Ganga Valley, and all its phy-



Fig. 5.1

sical, human, cultural and economic fabric seems to have been woven out of the various unique phenomena interplaying in transition. Transition is, thus, its chief forte, and within the Himalaya and Peninsular bounds, its physiognomy, morphology, geonomy and human panorama have all, in large measure, derived their strength and character from the east-west openness which allows free flow (circulation) of the western waters and the Westerlies and the eastern currents (of the Bay) and the Easterlies, and also, historically, of the men and ideas, techniques and inventions, from the east and west, which cross-fertilize in this crucible land and miscegenate and melt into the social milieu and economic-cultural patterns, so well expressed in its field and crop combinations, the house types and dresses, the language and social traditions, the crafts and skills, etc.

Thus, it is the cultural and economic patterns which provide unity and coherence to this region and a geographic personality. The northern limit is provided by the Indo-Nepal International boundary which broadly cuts through the Bhabar and Tarai zone down the Siwaliks, and only in the northern part of Champaran (Bihar) a small chunk of the Siwaliks is included in this region. In the south, the 150 m contour marks the boundary and skirts down the bold face of the hill-spur-scarp and alluvial embayment zone of the Vindhyan-Rohtasgarh-Chotanagpur plateaux, thus excluding most of the Mirzapur district, Chakia tahsil of Varanasi district, Kaimur-Rohtasgarh plateau and, further east, only the southernmost strips of Gaya, Monghyr and Bhagalpur districts and all the subdivisions of Santhal Parganas except Godda. The eastern boundary of the Upper Ganga Plain marks the western limit of this region while the eastern limit corresponds to the Bihar-Bengal state boundary except the Kishanganj sub-division in the N.E. of Purnea which has been included in the Lower Ganga Plain.¹ The traditional historico-cultural boundary between Bengal and Mithila has followed the old Kosi or the old Kosi-Mahananda Divide, the old Kosi "to have flowed through the lower reaches of the present Kankai and the Mahananda

rivers". The Bihar-Bengal State boundary roughly follows the Divide except in the north where it runs to its east to include the Kishanganj subdivision of Purnea. It is to be recalled that part of Kishanganj tahsil had gone to West Bengal on the verdict of the States Reorganisation Commission on linguistic basis.

So delimited, the Middle Ganga Plain includes the administrative divisions of Gorakhpur and Varanasi (excepting part of the Chakia tahsil of Varanasi district and major portion of Mirzapur district) and tahsils of Balrampur and Utraula (Gonda), Faizabad, Tanda and Akbarpur (Faizabad), Sultanpur and Kadipur (Sultanpur), Patti (Pratapgarh) and Phulpur, Handia, Karchhana and Meja (Allahabad) in Eastern Uttar Pradesh and divisions of Tirhut, Bhagalpur (excluding Kishanganj sub-division and including only the Godda sub-division) and Patna, leaving out the area above 150 m in the south. The maximum length from east to west is about 600 km while its width from north to south approximates 330 km.

Historical Background

The region appears to have been occupied by human settlements deep down during the pre-historic times. Fifteen thousand years ago, man in this region was in the palaeolithic age, with a nomadic way of life. Civilization based on rudimentary agriculture and crude metal-working dates back to about 10,000 years.² Even as late as "3500-2500 B. C. man eked out a precarious existence...and there was hardly any trade in essential commodities. Indeed there was no surplus; man lived on the edge of the needs".³ A self-sustaining economy, probably in the strictest term of each family, was the order of the day.

From time immemorial, the Middle Ganga Valley has remained a crucible of numerous ethnic groups. For instance, it formed the meeting ground of the two of the greatest pre-historic peoples, viz., the Mediterranean-Armenoid and Munda speaking peoples. This fusion of two different races with different culture traits brought about a remarkable material and cultural up-

heaval¹ which gave rise to diverse systems of rice and wheat-dominant cropping, while the works in metal, stones and woods, depending on the skill of hand, must have produced differential patterns of specialization.

The Indian way of life emerged with the birth of the 'Indian Man' as a result of the miscegenation of many distinct groups like those of the *Nisada* and the *Kirata*, the Dravidian and the Indo-Aryan or Indo-European and possibly many other less dominant culture groups. Already, before the advent of the Aryans, the region appears to have developed an organized agricultural society which knew "how to form well-ordered villages, how to make forts and buildings and to prepare reservoirs and tanks for irrigation".⁵ Thus, unlike 'the decayed or decaying empire of the Indus valley' the Aryans found the non-Aryans in full blaze of civilization in the Middle Ganga Valley where they advanced fully as much by alliances and voluntary submission of the inhabitants as by conquest.

In the early Vedic literature (i.e. the *Rig-Veda*), there is only casual reference about the region; only "occasionally the Ganga and very rarely the Yamuna and the Saryu (the Ghaghara) are also referred to, but not as being important. Neither the *Kosala* nor the *Videha* so famous in later Vedic literature, is mentioned in the *Rig-veda*".⁶ The roving Aryan tribes like the *kurus* the *Panchalas*, etc., which settled down in the Punjab and Upper Ganga Plains, and as they became territorial powers, the waves of cultural assimilation and colonization as of conquest flowed to the Middle Ganga Valley. The process was slow, however, as the region was more forest-clad, and yet it was too rich, varied and seductive to be ignored. The Purbia Plains were settled first and Varanasi and Ayodhya emerged as two great political, cultural and colonizing hubs, situated as they do on the navigable Ganga and the Ghaghara, the two greatest regional bonds and carriers of civilization and culture as of conquests and commerce eastwards. The Aryan settlements could be established beyond the Sadanira (the Gandak) in *Videha* (N. Bihar Plain) only towards the end of the Vedic period or even

in the beginning of the Brahmana period, before the *Mahabharata* war.⁷ The river Sadanira formed the boundary between the *Kosalas* in the Saryupar Plain and the *Videhas* in the N. Bihar Plain. *Magadh* was then "an impure non-Aryan region" and so was also its eastern neighbour, the *Anga*. The *Yajurveda* associates the *Magadhas* south of the Ganga with the *Vratyas*, a people different from the Aryans in their culture falling as they did also out of "the orbit of Brahmanism".⁸ *Videha* or *Mithila* and *Magadh* were culturally and politically different; Mithila, however, lost its political supremacy to the more strategic and resourceful *Magadh* which was not fully aryanized even up to Buddha and which became "one of the earliest homes of Buddhism and remained a centre of that faith until the Muslim conquest".⁹

In the wake of Aryan colonization and cultural assimilation, the region seems to have developed a more advanced agricultural society, based mostly on the indigenous labour and technique and the superimposed political and social leadership. Though social stratification and hierarchy had already begun in the growing society, it had not hardened till then. Towns and villages emerged. The Vedic fire cult (fire being used for burning the forest or 'purifying the land by *Agni* to make it fit to be lived in by the Aryans')¹⁰ was adopted for clearing the forests; marshes were reclaimed, irrigation works raised and trade routes developed. The Aryan decimal territorial system was also superimposed on the existing frame; the society founded groups of 10, 20, 100, and 1,000 villages, the ruler of each group being called *Dasgrami*, *Pimstipa*, *Satgrami* and *Adhipati* respectively; their strongholds must have also been in such hierarchical order as their territories.¹¹

Among the sixteen States of North India in Buddha's time, *Kosala* (Awadh) of Saket and Sravasti, *Vatsa* of Kausambi (to the west of Allahabad), *Magadh* and *Anga* were powerful kingdoms while there were several confederacies such as of the *Vrijjians* of eight clans, i.e., the *Licchavis*, the *Jnatikas*, the *Videhas*, the *Vrijjis*, etc. (replacing the old kingdoms of *Videha* and *Visala* in North Bihar), the *Mallas* of Pawa (Padrauna) and *Kausinara* (Kushinagar) in the

eastern and the *Sakiyas* in the northern Saryupar.¹² Although there were political rivalries, the social, cultural and trade interactions linked these territories together. Magadh, with some alternating vicissitudes, rose several times as the greatest regional and national power by annexing the neighbouring territories in the north, east and west and superimposing on others, as in the reigns of Bimbisara, Ajatsatru, Mahopadmananda, the Mauryas and the Guptas, etc. While Varanasi was the cultural hub of the region, Pataliputra, the Magadhan capital, became the political centre indicating the "growing strength and confidence of Magadh and of the growing importance of the Ganga both for trade and politics".¹³

Throughout these times, agriculture was in expansive stage and formed the mainstay of the people and the chief source of revenue to the state. The King seldom claimed ownership of the Land, which was vested into the *gramani* (the villager). He, however, received his share of the produce of the Land, varying from one-sixth to one-third. Mauryan state did all its best in the field of economic organization and development as it did in state craft; from reclamation of jungle and marshy land and irrigation to the provision of roads and storage facilities and safe and honest trading channels; from industrialization and development of rural and urban crafts and skills to the proper redistribution of population and direction of emigration and protection of caravan routes, all these and much more were looked after by the State. There was boom in agriculture, trade and industry, their products being no longer based on warfare, but having become a source of gold through external trade. Apart from the war-needed manufactures, textiles, ivory industry, metal works, carpentry, pottery and jewellery etc. had developed and were located in cities like Varanasi, Ayodhya, Sravasti, Kushinagar, Mithila, Vaishali, Pataliputra, Gaya, Rajgir, Champa etc., in their different functional quarters. Magadha and Kosala vied with each other to have Kashi under their sway. These cities were connected by *Kachcha* unbridged roads and through the Ganga system took part in the maritime trade; "Champa

and Pataliputra were ports from which boats sailed to Ceylon and Svarnabhumi." Sravasti to Rajgir via Vaishali, and crossing the Ganga at Pataliputra, was very important route which was further connected to Ujjaini in the west and Pratisthana on the Godavari through the Son valley. The region used bullion for trade. Cities had become centres of commerce, industry, politics and culture. Large cities like Ayodhya, Pataliputra, Rajgir were walled and gated, and had even watch towers. Varanasi had developed into blocks, main axial roads running parallel to the crescentic Ganga.

After the interlude of the Sunga, Kanva and other obscure and weaker dynasties and the Kushans whose power seems to have hardly reached Varanasi 'for a time'; the Guptas (A. D. 320) again unified the region and became a national power, ruling from Pataliputra. Well-administered and prosperous, the empire was divided into *bhuktis* or *desas* and *Vishayas* or *Mandalas*, *Nayas*, *Janapadas* and villages, etc. Notable among the *bhuktis* in Bihar Plain were the Tirabhukti (Tirhut), north of the Ganga, Srinagar-bhukti (Patna, Shahabad and south Monghyr), Magadha bhukti (Rajgir and Gaya)¹⁴. From 4th to 7th century, the famous port of Tamralipti in Bengal was connected to Pataliputra, which also negotiated with the west coast ports via Ujjaini. Kalidasa's *Mahapatha* extended from Pataliputra to Afghanistan in the west.

During the weak period of the later Guptas, Sasanka, the King of Bengal and formerly a feudatory of the Guptas at Rohtasgarh, ruled over Bihar, Orissa and eastern part of Uttar Pradesh. Magadh would no longer rise to national power, and the Middle Ganga Valley, except in the brief interlude of the unifying and strong North Indian power of Harsha would be appended to Bengal powers or would remain divided most of the time into small, warring powers till the rise of Turko-Afghan, and more surely the Moghul powers. Even during Harsha's time, as Huen Tsang reported, "parts of Saryupar had relapsed into jungle, the great city of Sravasti was occupied by only 200 families and the holy cities of Kapilvastu and Kusinagar

were waste and deserted.”¹⁵ Under a 300-year rule of the Palas, the Gupta model of administration was more or less carried on and saved the region from chaos. Politically, however, the region was punctuated in parts, and in interludes of the strong Palas by Pratiharas, Rastrakutas, Gurjars, (west), Chandras (Bengal), Chandels and Chedis (south), Kalachuris (Gorakhpur), Kaivartas and Varmans (Bengal), Gahadvalas (west), etc.¹⁶ Most of the petty powers, however, possessed “none of the elements of permanence... (they) were engaged in constant local struggles and all that remains is the shapeless mounds which cover the ruins of their cities”. The region so divided could not even put a semblance of resistance when Bakhtiyar Khalji overran it.

Under these anarchical conditions, in Eastern U.P. as also in other areas, the ruling people seem to have lost their hold over the countryside. As a result, the aboriginal classes “succeeded in receiving firm possession of their ancient seats”.¹⁷ They lived, according to tradition, in brick-built villages and fortified towns, and brought wide area under cultivation. Their territory was “split up into several principalities, perfectly independent of each other; each chief exercised authority over his own sect and over that alone; to no particular one of them was conceded the hegemony of the rest.”¹⁸ The ubiquitous mounds of their villages and towns, with remains of large rectangular brick houses, forts and their *Surajbedi* (east-west diameter) tanks as against the *Chandrabedi* (North-South diameter) tanks of the Aryans, bear testimony to the prevalence of their suzerainty.¹⁹

While the region was occupied by aboriginal culture groups and other decadent powers, the Upper Ganga Valley and neighbouring regions formed the crucible of several Rajput dynasties out of which the fighting ‘Rajput clans never heard of in earlier times’ filtered through waves after waves and dominated the regional socio-economic, and to some extent, the political scene for a long period from the 10th century to the 18th century.

As the national scene during the Turko-Afghan Sultanate period was characterized by Muslim

invasions and change of dynasties after dynasties, the region, was slowly but steadily occupied by various Rajput and allied clans. The local Rajas or clan chiefs doubtless continued to hold the region within their particular jurisdictions as independent or at worst semi-independent sovereigns, the nature of their sovereignty depending on the hold of the national or regional power. Even in Bihar, which was under rather stronger Muslim hold, “the neighbouring Hindu regions still had powerful Hindu Rajas who, although militarily overpowered, had not been thoroughly subdued.”²⁰ During the Sharqi rule of Jaunpur (A. D. 1394-1488) also this state of affairs continued, and chiefs were at most tributaries rather than subjects to the Delhi Sultanate. It is under the auspices and patronage of such Hindu Chiefs that the medieval settlement pattern, the characteristic village organization with its *Jajmani* system, and the adhesive rural polity in the region were so organized as to withstand the tyranny and maladministration of the age. The clan centres emerged essentially as natural functional centres of local defence, higher skill of arts and crafts, trade and commerce, and social and cultural organisation.²¹ Mithila, for instance, continued to have the local administration consisting of *Gulma* (groups of three or five villages), 10, 20, 100, 1000 villages, etc. Even the Muslim administration, as Ibn Batuta notes, had *Iqta* (fief) or *Pargana* and *Shiqs* (districts) based on old form, such as “*Sadi*, an aggregate of 100 villages, as an administration unit” as “the *Satgrami*.”²² In the overall picture, the resistance to Muslim rule was weaker in Bihar than in U. P. and in S. Bihar than in N. Bihar. The region was economically prosperous, and Banjaras, the roving traders, were the chief carriers of trade. Varanasi and Bihar Shariff, the capital city of Bihar, were the principal clearing houses of trade.

The prevailing insecurity caused to focus the economic and social life of the countryside on these securely held strong points. The tripartite territorial basis of administration and organization continued under the Moghuls also : the national central administration functioned through regional levels of *Subabs* (provinces), *Sarkars*

(divisions), and *Dasturs* (districts) under which the traditional local jurisdictions of clans and chiefs functioned at the level of *Parganas* and *tappas*, with some influence of the super power.²³ The Saryu-par and some other outlying areas were not integrated politically, or for that matter, economically, with the national or regional mainstream; even after the establishment of garrisons at Gorakhpur and Maghar by Akbar, the exotic hold was only intermittently felt in such outlying regions.

In the late medieval period the region was divided into several powers, while the Eastern U. P. Plain was under the Nawab of Awadh who played rather free from the weak Moghul power, and partly under the Banaras Raj, Bihar with Bengal and Orissa was under the grip of the Bengal Nababs and later under the dual administration of the East India Company and the Nawabs. It was one of the worst periods of history for the region. The political chaos and corruption turned the land into the free-for-all style administration, as much at the hands of the tax collectors as of the free-booters, and even the trading Banjaras turned into dacoits. The battle of Plassey (1757) brought the supremacy of the British up to the Karamnasa, and that of Buxar (1764) blew a death knell to the Muslim or Indian rule; the pressure mounted on the Banaras Raj and the Nawab of Awadh. The trade and factory system of the European powers, particularly of the East India Company, and later its *Divani*, disjoined the prevailing economic and social balance by opening the region to the foreign trade to their own benefit; the region which was in the 16th and 17th centuries most contributive to the "agricultural granary and industrial workshop" that was India then, turned into poverty-stricken and famine-infested. Ralph Finch (1583-91) wrote "that the region on both the sides of the Ganges from Banaras to Patna contained many fair towns and was very beautiful"; and Patna had become a great trading centre of not only Hindustan but of the international commerce. Richard Becher reported before the Secret Committee of the Court of Directors of the East India Company (24th May, 1769) how "this fine country which flourished under the

most despotic and arbitrary government is verging towards its ruin".²⁴ At least 7 million people had died in 1770 famine in Bengal (including Bihar) and the Court of Directors wrote (Aug. 28, 1772) that "the English servants of the Company had turned the public distress into a source of private profit."²⁵ All this chaos brought in its train poverty, famine and administrative high-handedness, which culminated into the nation's First War of Independence (1857-58). It is notable that the people of this region, particularly of Eastern U. P. and W. Bihar, and more so of Bhojpur plain (i. e. the Ujjains of Shahabad, whose leader Babu Kunwar Singh of Jagdishpur, an octagenarian, is still regarded as a National hero), fought so bravely against the British.

After the struggle, the region came under the British Crown administration, and efforts were started to organize the area politically and economically and to bring effective social change. The Eastern U. P. Plain formed part of the North-Western Provinces, later called United Provinces of Agra and Oudh, and after independence, Uttar Pradesh, while Bihar was separated from Bengal as a province in 1912. The British organized the provinces into districts, tahsils (sub-divisions) and parganas for administrative purposes, with some modification in the Mughal pattern, and the police, health and other institutional reforms were also introduced at these levels. In course, the widespread political instability disappeared under the tightened British bureaucracy which wielded power and influence up to the village level, although by disrupting the old *Panchayat* system, etc. Prevalence of peace, increasing means of road and rail transport, fixed taxation on agriculture and other occupations, establishment of educational and technical institutions, and hospitals, etc. led to economic development and rapid population growth. More demands and increased trade led to widespread increase in extension of agriculture, particularly in the Tarai region. The free flow of imported machine-made goods, however, disjoined the traditional balance of industry and agriculture, as a result of which millions of cottage industry workers, more particularly the weavers, became jobless, almost

overnight and unlike Britain herself or other industrial nations at that stage, no other alternate channel of employment was provided (this is England's great fault ?); jobless, they fell to the already overburdened agriculture, the usual receptacle. Occupational structure was diversified, but job opportunities were too few. This led to the low per capita income (which fell rapidly during the British regime), high rural indebtedness, and heavy dependence on agriculture, which itself again did not show any qualitative progress in yields. The lucrative trades in saltpetre, or even the indigo and opium cultivation and trades were mostly in Englishmen's hands, and the associated social and economic troubles, particularly of the *Champaran* type, which shocked the nation as Gandhiji fought over it, are still remembered in the country.

More so, the British administration could not forget and forgive the people of the region, as mentioned above, for the sin that they committed by putting a constant and stubborn fight culminating in 1857-58 against the British Raj in its formative years. As such, the administration developed a stepmotherly attitude towards the regional development, particularly of the Eastern U. P. and Western Bihar; once the proudest wing, the *Purabia* unit of the British army which brought her many laurels and won many a battle for England up to Middle East and Hong Kong, was disbanded, and in general, the people of the region were dubbed as 'Non-Martial' in army recruitment circles. While the Western U. P. was provided facilities such as irrigation, power, roads and other services, the Eastern U. P. not only remained under the full brunt of negligence on the part of the government, but was also allowed to undergo continuous hardships of droughts, floods and epidemics with very inadequate relief or remedial measures. The resource potentials, both human and physical, were not only not developed, but were also allowed to decay and decline, and the regional economy fell far behind that of other regions. The *Purabia jawns* who were once proud of their rich land and heritage, had to migrate into the *chawls* of Bombay or *bustees* of Calcutta, or the collieries,

and their stocks also settled in Africa, S. E. Asia, Fiji Islands, Mauritius etc. Problems of overburdened agriculture, lack of irrigation, transport facilities and capital, mass illiteracy and a fast growing population, etc., of the last hundred years and the attendant problems intensified the void, and when National Government came to the forum in 1947, it found, in course of fixing the target for the sick and the depressed economy that the problems were 'hydra-headed', as Spate has put it, and various problems were so urgent that priorities were difficult to be fixed; in point of fact, a 'dead weight' had to be lifted.³⁰ This regional imbalance has created serious political and social problems: for instance, the economic void between the prosperous western part of U. P. and the poverty-stricken underdeveloped eastern part has led to the partisan attitude among the Government and the politicians of the State, and Sardar K. M. Pannikar, member of the S. R. C. (1956) made a sinister move to bifurcate the State on this point, as according to him, the developed western part had to bear the brunt of the sick economy of the eastern region. In fact, the economy of the entire Middle Ganga Plain is in a bad shape, and must be strengthened with full imagination and prudent resource management.

The Physical Setting

Structurally the region is a segment of the great Indo-Ganga trough; however, it has some marginal portions of the other two major formations, that is, the Siwaliks in the northern part of Champaran District and the fringes and projections of the Peninsular Block in the south (Fig. 4.2). The Himalayan foot-hills region of the Siwalik formations covers an area of about 364 km² and continues across the Indo-Nepal boundary towards north. Between the relatively lower (Peak 237 m near Santpur) and shorter (32 km long 6-8 km wide) Ramnagar Dun Hill Range and the northern, higher (Sumeshwar Fort, elevation 865 m and longer (72 km long) Sumeshwar Range lies the Harsha Valley, called the Dun, about 22 km long and below 150 m in elevation; there are three important negotiable passes, the Sumeshwar Pass along the Juri Pani

stream, the Bhikhna Thori Pass up the Kudi river and the Marwat Pass through the Harha river valley. The stream action has made the sedimentary formations very rugged and rough.

It is evidenced that although the average alluvial filling may not exceed 1300-1400 m, it varies widely from one part to another; particularly the depth increases up to 8-10,000 m as the Himalaya are approached while it thins out as a mere veneer on the Peninsular margins. In fact, there are two large troughs, which may be called Gorakhpur trough and Raxaul-Motihari trough, over 8,000 m deep in the north, south of which along the Darbhanga-Bareilly alignment 6,000 m depths run almost parallel. South of the Ghaghara in the Eastern U. P. Plain and of the Ganga in the Bihar Plain, the depth falls below 1,500-3,000 m, except a few patches in the Ganga-Ghaghara interfluvium being deeper. It is indicated that the entire region has suffered great downwarping due to the Himalayan upheaval. The basal rocks seem to have faulted transversely at places and dislocations

in the earth's crust along such pre-existing faults or cracks cause earthquakes.²⁷ Fault lines can be seen running N-S or NE-SW, one through west of Muzaffarpur and Patna and the other east of Purnea (Fig. 4.2).

The nature of the alluvial sediments has been already noted; here *kankar* formation is relatively less because of more riverain character of the plain, and more particularly of the higher incidence of *Khadar* lands.

Hemmed in between the foot-hills of the Siwaliks and the *Bhabar* in the north and the Peninsular uplands in the south, the region is almost a synonym of a homogeneous level, seemingly featureless plain from one end to the other, and the monotony of relief never appears to lose until the hills are actually approached; in small topographic facets, however, the plain is not without interest. In general, it is below 100 m above the sea-level, except that it gradually rises from Domariaganj in Basti up to 130 m in the NW, 105 to 110 m in western fringe, and up to 150 m

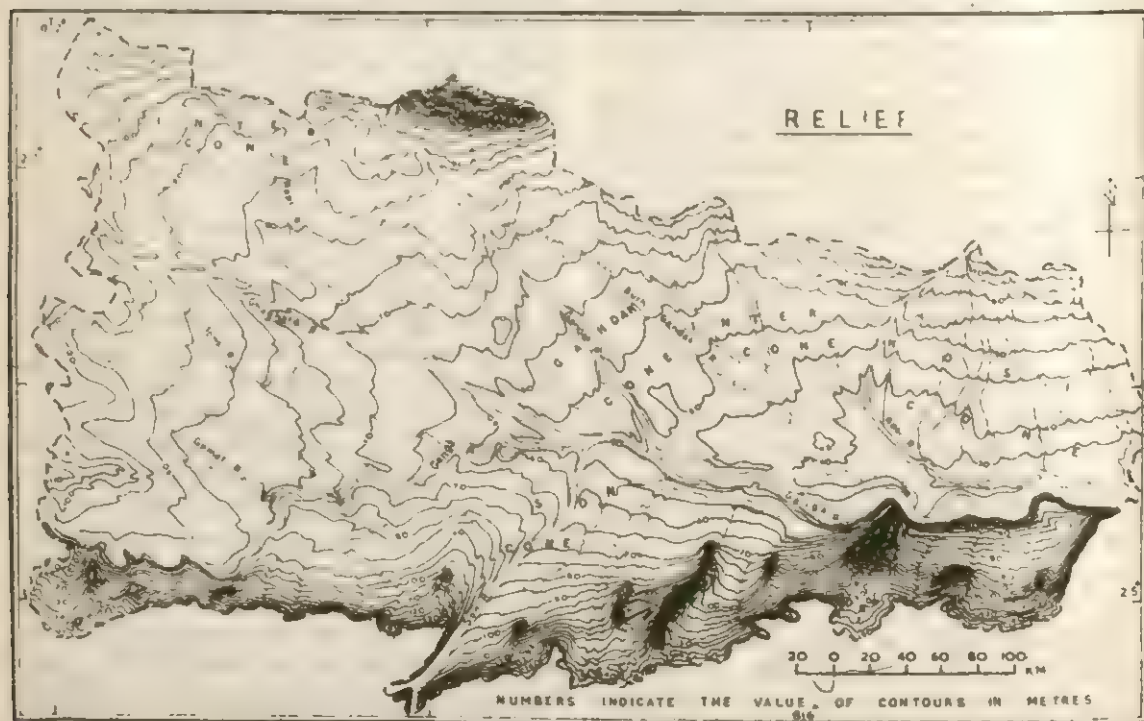


Fig. 5.2

in the south incorporating the projections of the southern uplands; in the east the Kosi Plain ranges between 30 m in the south to 75 m in the extreme north (Fig. 5.2). Heterogeneity, if any, in the physical landscape is produced actually by local eminences such as river levees and bluffs, or sandy features like the *Dhus* of the Saryupar, the oxbow lakes, *Tals*, *chaurs*, dead arms or remnants of the river channels, or occasionally available badlands and ravines as those of the Sai and the Gomati, or not infrequently perceptible notches and slopes carved by the rivers at the outer edge of the *bhangar* tracts. A more pronounced relief is occasioned when the plain meets the hilly area; in the north, beyond the Tarai, are the Bhabar plains, actually not falling within the region, but bearing the stamp of their loosely-set gravelly nature and talus slopes over the Tarai, particularly in the extreme north, where the surface appears to be broken by large rivers, like the Ghaghara, the Rapti, the Gandak, the Baghmata, the Kosi

etc., which comb the region with their affluents in an intricate pattern.

Obviously, it is difficult to divide the region into physical sub-units on any prominent foundation of relief, except through the help of the river-systems which generally carve out somewhat inter-distinguishable relief and slope, differential nature of drainage based on the rainfall regimes and the proximity of the hills, and the all-resultant sub-soil water table of varying depths in different parts of the region. Based on these somewhat cogent foundations, the region may be sub-divided into the Ganga Plain North and the Ganga Plain South (Fig. 5.3).

The Ganga Plain North can be further divided into (i) the Ganga-Ghaghara Doab, (ii) the Ghaghara-Gandak interfluve, (iii) Gandak-Kosi interfluve and (iv) the Kosi-Mahananda interfluve. As Geddes has worked out,²⁸ the broad relief features of the entire Saryupar and N. Bihar Plain are a series of alluvial cones formed

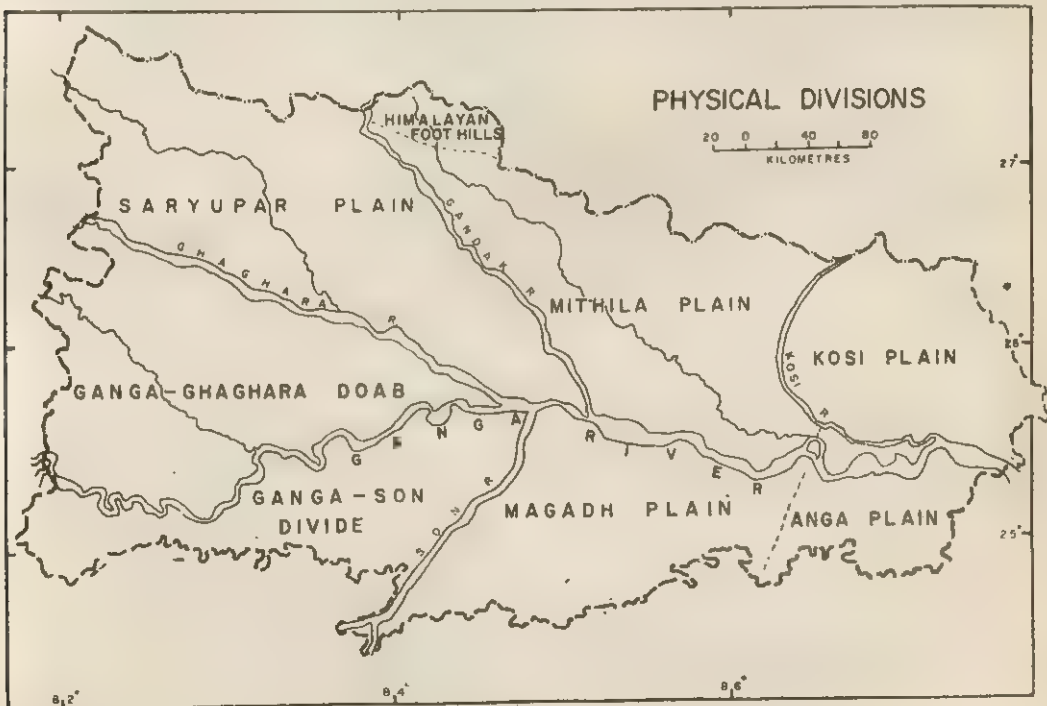


Fig. 5.3

by master streams along with the inter-cones or the intervening slopes between them. Generally and quite naturally the inter-cones have lower gradients than the cones. Excepting the small chunk of Siwalik formations, the vast N. Ganga Plain is absolutely featureless, without a single hill, the surface variations are all the result of the drainage lines as discussed above.

The Ghaghara-Gandak interfluvium is diagonally divided by the Rapti while other streams like the Burhi Rapti, the Kuwana, the Chhoti Gandak and other rivers also drain this area. There are numerous oxbow lakes, *tals* and dead or deserted channels of the rivers; the *Tals* like Ramgarh, Chando, Bakhira, Chillua, Likhia etc., have resulted due to the changes in the courses of the various rivers. The northern *tarai* has a moist belt in the extreme north followed by the *sub-tarai* belt of marshy lands with intervening uplands, which is again followed in the south by another, rather wider belt of marshy lowlands, devoid of uplands and having marshy lakes and depressions. Towards the south lies the upland zone till the Ghaghara levees or flood-plains are approached.

The same zones follow in the N. Bihar Plain where the land is also dotted with lakes and elongated *chaurs* and dead channels. The Kosi-Mahananda interfluvium has more of these features as the river is notorious for its shifting channels. However, both the Gandak and the Kosi have been confined to their channels by embankments.

The Ganga-Ghaghara doab has a different physiography: although there are a number of *tals*, oxbow lakes and deserted channels of river, particularly along the Ghaghara and in the eastern parts (i.e. Surha tal in Ballia), most of the land is *Bhangan* which is not subjected to annual floods. The Gomati divides it diagonally into two halves.

The Ganga Plain South can be divided into four parts—(i) west of the Karmnasa, (ii) Karmnasa-Son interfluvium, (iii) the Lower Son valley and (iv) Magadh-Ang Plain. As is obvious from the figure, the Ganga Plain South is defined by the 150 m contour rather irregularly because of the spurs and the scarps of the Peninsular uplands. It is very narrow west of the Jargo river (Chunar),

and wide up to 100 to 140 km in the Son valley, again shrinking to 40 km opposite Giddhaur hills and widening to 65 km in S. Monghyr and Bhagalpur but tapering hardly to a 3 km-wide ribbon when the Rajmahal hills project themselves against the Ganga to separate the region from the Lower Ganga Plain. The alluvium deposited here has been brought from the southern uplands and is relatively coarser; it also lacks the ox-bow lakes which are so commonly found in the northern plains. In the narrow Gangapar Plain west of Karmnasa, a typical topography is met with arising from the contact of the plains with the small, flat-topped and heavily eroded hillocks separated by broad embayments of alluvial flats formed by the aggradational actions of the rivers debouching with heavy loads, and near Vindhya-chal and at Chunar (crowned by the ancient Chunar fort) hills project on to the bank of the Ganga; it is beyond this traditional contact relief zone of a few km that the typical scarp faced slopes or pentland topography of the Vindhyas becomes the characteristic feature.

The relief east of the Karmnasa is free from the pent-land topography. The southern edge is relatively more regular, particularly in the Bhojpur Plain, while the general surface east of the Son is more or less even and is dotted with residual conical hillocks, sometimes forming elongations up to the bank of the Ganga. The lower Son valley is a physiographic unit in its own right, although the flood-plain is itself narrow. East of the Son in the Magadh-Ang Plain, there are a number of hills like the Barabar, the Rajgir-Jethian (446 m at Rajgir) and more significantly the Kharagpur hills, running in SW-NE elongated ridges; the Kharagpur hills throw themselves against the Ganga near Monghyr and their sub-alluvial projection causes the river to have a sharp bend. One rather peculiar feature is the extension of the low-lying area called the *tal* in Patna district, south of the levee of the Ganga, perhaps marking the old bed of the Son.

Drainage

Drainage lines hold particular significance in the region: not only do they provide redeeming

topographic breaks in the general flatness of the plain and provide sub-regional or even local uniqueness and individuality to the different parcels of land, but they also govern to a great extent, the human occupancy of land, particularly the agricultural land and settlements.

The drainage pattern is dendritic in general, and the general characteristic feature available throughout the plains is that the rivers meet at acute angles, and several tributaries form parallel or sub-parallel lines to the main streams (Fig. 5.4).

The Ganga is the master stream and is the recipient of all water lines in the region. The regional drainage can be studied through the

subsystems : (i) the Ghaghara system, (ii) the Gandak system, (iii) the Kosi system, all north of Ganga, (iv) the Son system and (v) the other tributary drainage to the Ganga.

The Ganga, a snow-fed Himalayan river and heavily laden with detritus, flows sluggishly west to east, through the central-southern part of the region, being closer to the Southern Uplands than to the Himalayan wall so that while its northern perennial (except a few) tributaries have a wider arena to carve out their flat valleys through their highly meandering courses, the southern tributaries meet the Ganga rather hurriedly because of steeper slope, particularly east of Mon-

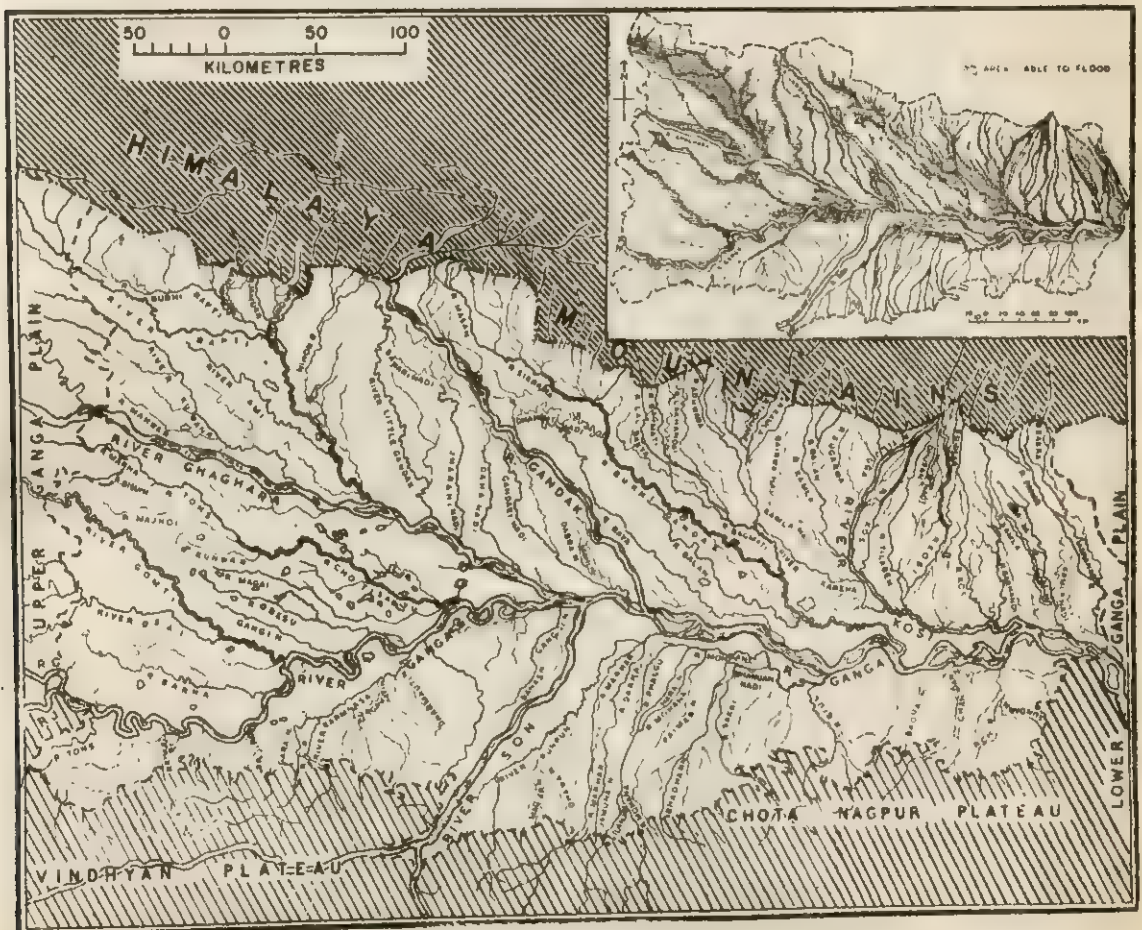


Fig. 5.4 : Drainage Pattern of Middle Ganga Plain : Inset—Area liable to flood.

ghyr and west of Rohtas. The average gradient is 9.5 cm per km in the region, slowing down to 6 cm in Bihar. The flood-plain varies from 5 to 30 km or more and is known as *Khadar* including sometimes vast *diara* lands between the occasionally braided channels and also sand flats, all subject to annual inundation. The Ganga banks are infested with stable and high (10 to 15 m) levees intercalated with *Kankar*, gravel or other resistant rock reefs as at the site of Mirzapur, Varanasi, Patna, or with the northernmost projections of hard rock basements of the southern uplands, e.g., sandstone at Chunar, quartzites at Monghyr : sometimes the projections appear in the mid-stream as at Sultanganj. As such, the southern bank is relatively more permanent and stable than the northern one.

In the Eastern U. P. Plain, while the Ganga receives the Saryupar waters through the Ghaghara joining it west of Patna (near Chhapra), most of the water of the Ganga-Ghaghara Doab East are received directly through independent large and

small tributaries, the Gomati, the Chhoti Saryu, the Mangai, the Besu and the Gangi in the Gomati-Ghaghara interfluvium, while the Varuna is the only important stream in the Gomati-Ganga interfluvium. All these tributaries are Plain rivers, even larger and perennial Gomati (Post-Siwalik) emanating from the Gomati Tal of Pilibhit.

The Ghaghara is the recipient of all drainage of the Saryupar west of the Gandak through its tributaries like the Kuwana, the Rapti, the Chhoti Gandak and other smaller ones. Since the general slope of the plain is from north-west to south-east, the Ghaghara receives almost no significant stream from the south. The Rapti, the chief tributary of the Ghaghara, is also a Himalayan stream while the Chhoti Gandak and the left hand tributaries of the Rapti, i.e., the Burhi Rapti, the Banganga, the Ghonghi, the Rohin etc., are Siwalik rivers and several others originate from the Bhabar or Tarai plains and still others from the mid-zone uplands or *tals* of the Saryupar Plain itself. The preponderance of the drai-

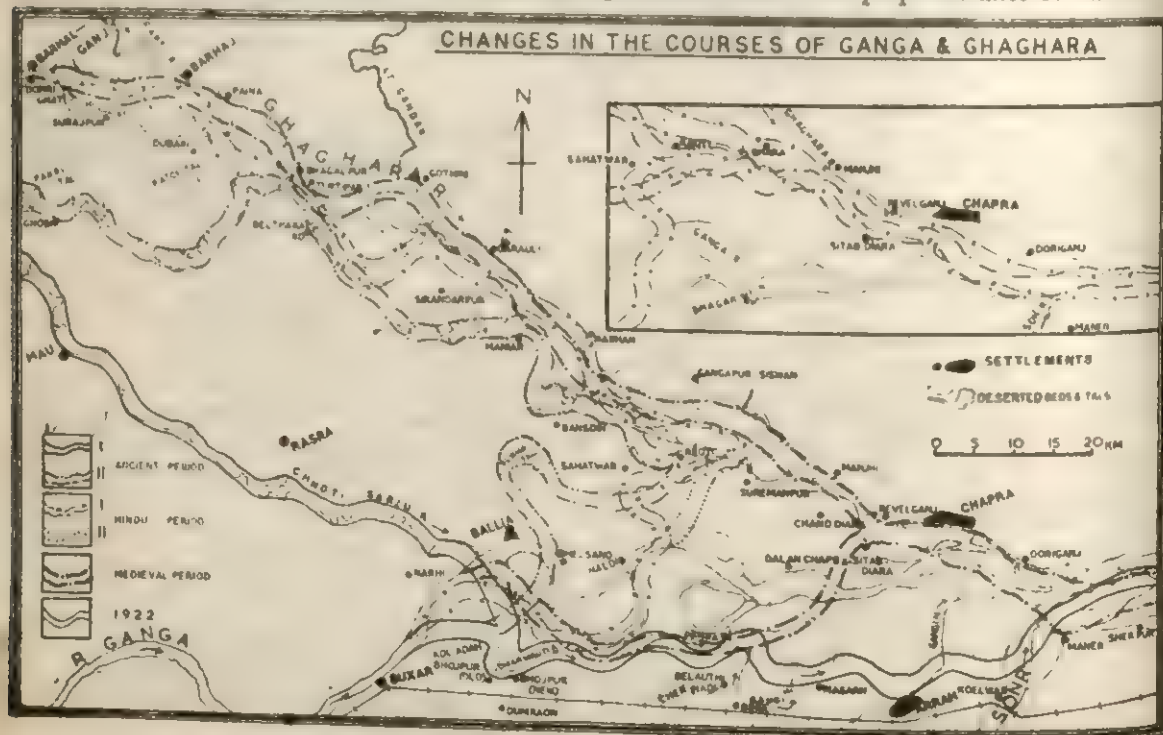


Fig. 5.5

nage lines and the resultant medium to fine drainage texture in the region may be partly attributed to the higher amount of rainfall and partly to the proximity of the Himalaya and the incidence of the *Bhabar* and *tarai* lands. The Ghaghara is highly notorious for its floods and changing courses and capacity of rendering vast agri-

cultural tracts into sand flats (Fig. 5.5). Other streams like the Rapti, although equally notorious deposit fertile silt and provide highly fertile agricultural tracts.

Unlike other large rivers, the Gandak does not receive any important tributary though it has a number of old deserted beds and distributary-

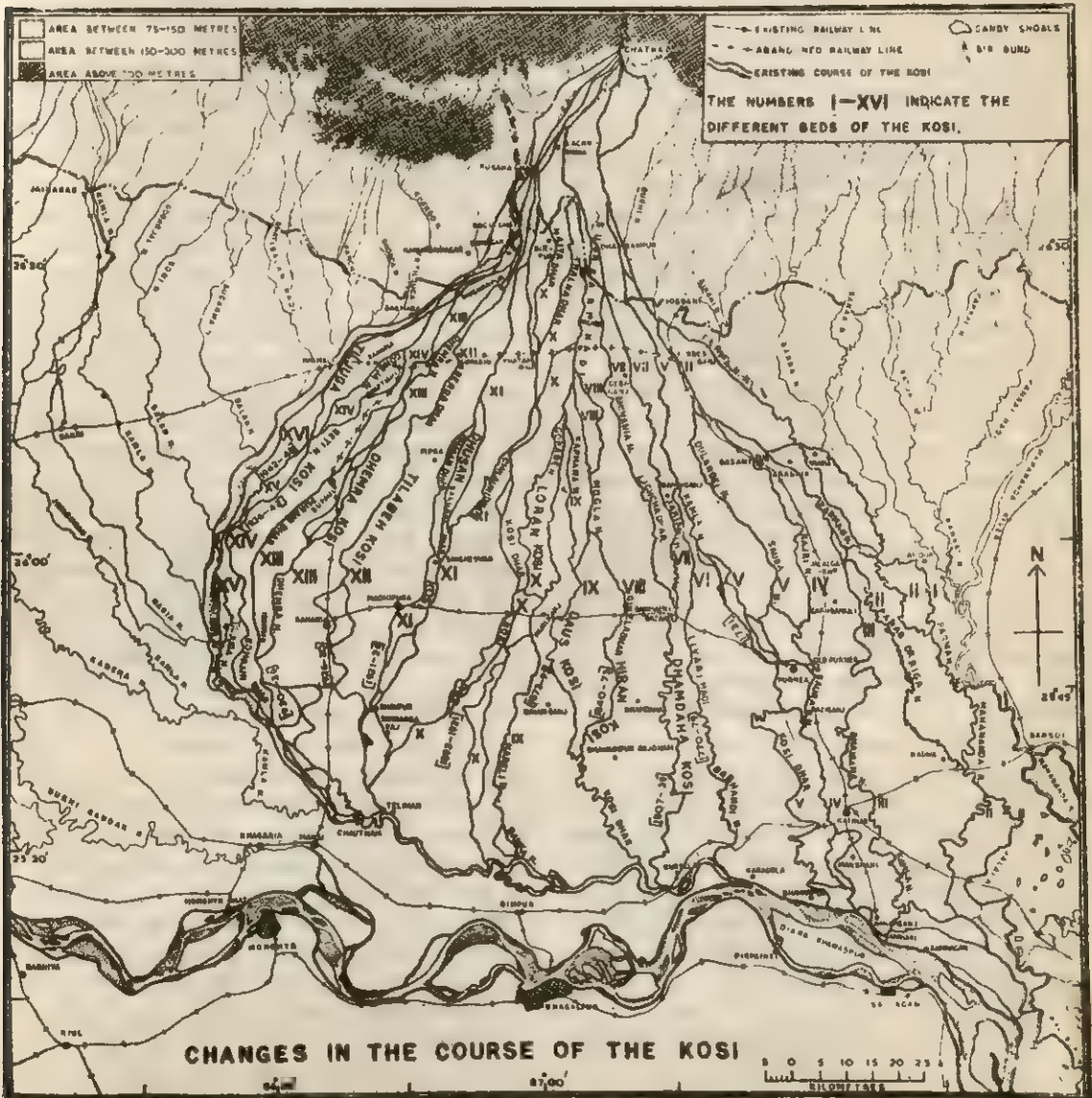


Fig. 5.6

like spill channels—the Banri, the Jharahi, the Daba, the Gandaki, the Dabra, the Mahi, the Dhanauti, the Baya, the Saran etc. It has a higher gradient than the Ghaghara and is, therefore, more notorious for floods and changing courses. The channel has been contained in its 5-7 km flood-plain by protective embankments on either side.

In between the Gandak on the west and the Kosi system on the east, the Burhi Gandak is the chief tributary of the Ganga and receives the waters of the Bagmati.

The Kosi, formed by seven important Himalayan streams (Sapt-Kosi) in the eastern Nepal, receives no tributary in the plains because of its raised bed; it meets the Ganga at present near a little below Kargola. It is the 'sorrow' of Bihar and the wildest and the most devastating of the Indian rivers, and flows through several capricious channels. Below the Chatta gorge, where the river enters the plains, there is a sudden break of slope. Unlike the Ganga and other rivers, "there is no sufficient space for the river to pass gradually through the stages of grading, maturity and aggrading old age. Here, after the impetuosity of youth, there is a sudden constriction of the advanced age, a sudden leap from the degraded to the aggraded stage with no graded interval—a sudden change from the young valley in the mountains to the deltaic stage of building and uncertain shuffle in the plains. This is the most critical feature in the (peculiar) character of the Kosi."²⁹ It deposits infertile sediments consisting of micaceous sands and renders vast fertile lands into sandy and marshy flats. The Kosi Project is an attempt to tame and train the river. A protective embankment from Bagha to its confluence with the Ganga has been thrown. The river has several distributaries like the Saura, the Kamla, the Barhadi, the Dhusan, the Tilabeh and its tributaries like the Sugarwa, the Balan, the Kamla etc.; most of these are seasonal (Fig. 5.6).

The Ganga receives numerous tributaries from the Southern Uplands among which the Son is the largest. They have a markedly steep gradient (Son with an average gradient of 35-55 cm per

km) with quick run-off and ephemeral regimes, being roaring rivers with the rain-waters in the catchment areas but turning quickly into fordable streams. These streams, being wide and shallow, become disconnected pools of water in the remaining part of the year. The channel of the Son is very wide (about 5 km at Dchri) but the flood-plain is narrow, only 3 to 5 km wide. The river has been notorious for its changing courses in the past, as is traceable from several old beds on its east, but has been tamed squarely with the anicut at Dchri, and now more so with the Indrapuri Barrage, a few km upstream (Fig. 5.7).

The tributaries of the Ganga west of the Son are smaller, the Karnauti, the Ojnala, the Khejuri, the Chatar, the Jargo, the Tons and the Karmansa; those on the east of the Son are the Punpun, the Mohini, and the Chandan. Each of these conjoint rivers has to flow parallel to the Ganga through the elongated *tal* (6 to 12 km wide and about 24 km near Mokameh) stretching to the south of its southern bank from near Patna in the west to Surajgarh in the east and muster strength to break through the bold levee. When repelled by the Ganga in spate, these rivers, flowing through a lower level as they do, are unable to empty themselves into the Ganga and inundate wide areas.

Floods are a recurring feature in the region, more particularly in the North Ganga Plain (Table 3). Not infrequently, when the Ganga itself remains in spate, and thwarts the incoming water from its numerous tributaries in the region, large areas get flooded leading to breaks of transport system and devastation of life and property. Defective and inadequate provision of culverts and syphons in the transport nets and canals add to the frequent flooding and water-logging. Almost all the rivers in the region develop a capacity to spill over in the monsoon period, and are notoriously dynamic in their character, particularly the great masters, the Rapti, the Ghaghara, the Gandak, the Kosi, the Son and the Ganga itself.³⁰ These rivers have shifted their courses frequently covering wide areas throughout the historic times as is reflected by the remnants of

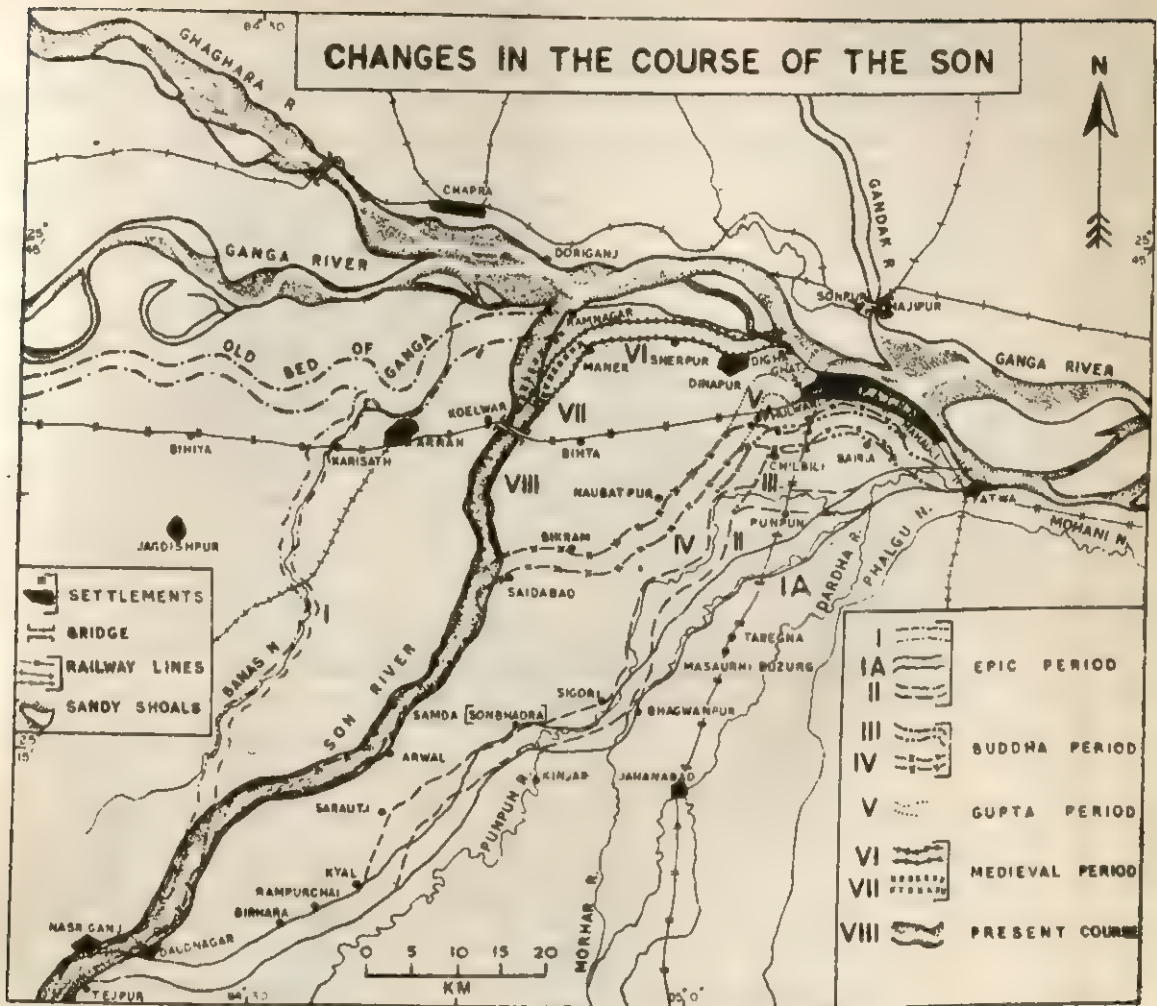


Fig. 5.7

their former beds in the form of ox-bow lakes, meander loops, dead arms, *chahrs*, tals and ruins of settlements, etc. For instance, the Ganga has shifted over 35 km between Bhojpur tal and Surha tal causing changes in the site of Ballia (Fig. 5.5). Towns and river ports like Gola, Barhaji, etc., have been affected by similar shifts of the Ghaghara (Fig. 5.5). The Kosi, the most dynamic among the rivers, has marched about 120 km during the last two hundred years from near the town of Purnea up to the Tiljuga within Darbhanga district (Fig. 5.6). Historically,

it has oscillated from the Brahmaputra to about the Ganga-Gandak confluence.

Climate

The lie of the land between the Himalaya on the north and the Peninsular foreland in the south, and lack of physical undulations to check the sweeping winds and air-currents from the east and west, conspire to make the region only transitional in character between the relatively drier Upper and perhumid Lower Ganga Plains on its west and east respectively (vide Tables 1 to 3). The winter cyclones with their occasional cold

waves, which persist sometimes for a week or more as in 1961, and the hot summer winds from the west sweep the entire region almost unhindered, although the general physical boldness of the Southern Uplands and the proximity of the Himalaya to the Saryupar and North Bihar Plains save the sub-regions, to some extent, from obstructions and extremes of weather, and at the same time enhance the effect of the benign weather regimes. The intensity of various weather and climatic phenomena in the western, central and eastern sections depends upon the sources from which they start; for example, only occasionally the cold spells associated with the westerly disturbances in winter reach up to Calcutta in the Lower Ganga Plain, while it is more frequent and persistent as one proceeds westwards; similar is the case with the Bay of Bengal depressions which are stronger, more frequent and rain-fetching in the Lower Ganga Plain and weaken west-

wards; the Lower Ganga Plain also suffers but the least from the incursion of dry winds (Loo) from the Upper Ganga Plain where it is more intensive than the Middle Ganga Plain, bringing in blazing conditions with droughts and crop failures etc. Thus, the Middle Ganga Plain, centrally situated as it is, gets all these effects transitionally filtered through; the summer heat is less intense than in the drier Upper Ganga Plain and also less moist and enervating than the Lower Ganga Plain. Likewise, the dust-storms are rainier here than the Upper Plain but much less than the Lower Plain, as also the winters are less rainy than the Western Plains but more than the Eastern counterpart.

Although the region has a somewhat continental interior location within the sub-tropical climatic belt, yet the monsoon reigns supreme here, and carries great weight in the overall human occupancy pattern and economic development.

TABLE 1
Average Seasonal Rainfall (in percentage of annual total)

	Winter (Dec-Feb)	Summer (March-May)	Monsoon (June-Sept)	Post- Monsoon (Oct-Nov)	Annual (in cm)
Bihar (North)	2.9	6.8	85.0	5.3	122.6
Eastern U. P.	3.9	2.9	88.0	5.2	99.3
Western U. P.	6.0	3.6	87.8	2.6	95.6

(Table based on Ramdas, L. A. : "Weather and Crops", *Handbook of Agriculture*, Indian Council of Agricultural Research, New Delhi, 1961).

The season of general rains starts abruptly (although it is preceded by the pre-monsoon showers) with the cloud-burst of the summer (SW) monsoon, heralding the active monsoon period usually by the 7th of June in the N and NE Bihar, gradually westward by 15th June in W. Bihar and the third week of June in the Eastern U.P. Plain; the northern fringes of the plain get earlier rain incidence owing to the proximity of the Himalaya. The advent of the monsoon is occasioned by almost a sudden rise of relative humidity to over 70%, a sudden fall in temperature (generally by 5° to 8°C), and sudden change of wind direction from the westerly and north-westerly to easterly and south-easterly.

The mean June temperature at Patna (32.9°C) drops to 29.7°C in July and 29.2°C in August, while at Varanasi the same recordings are 33.7°, 30.0° and 29.1° respectively. In the Ganga Plain North also the same trend occurs as evidenced by the recordings at Gorakhpur (31.5°, 29.6°, 29.2°) and Motihari (30.1°, 28.9° but with slight increase in August, 29.1°), although less marked than the South Plains. The maximum temperature generally rises in September owing to cessation of rains but the mean minimum temperature shows a slight decrease than in August. The season provides 85% of the annual rainfall in N. Bihar to 88% in Eastern U. P., mostly by the Bay currents. Also the areas with less annual rainfall

have greater dependence on the monsoonal rain than those with higher annual fall; this trend is evidenced by the percentage records at Purnea (87.9), Muzaffarpur (90.5), Gorakhpur (91.8),

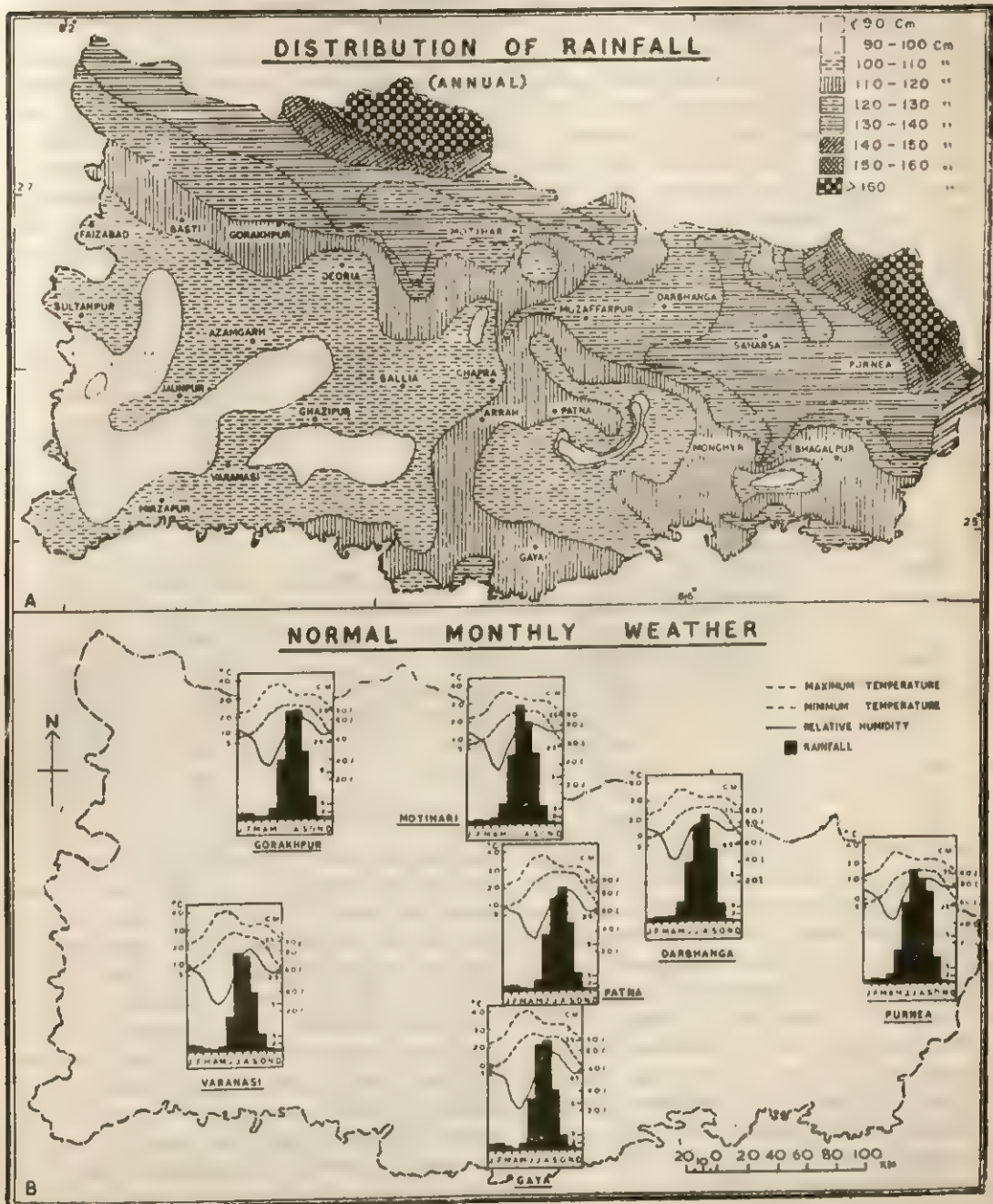


Fig. 5.8

Bhagalpur (90.7), Patna (91.6) and Varanasi (92.2), which also attest the trend of more monsoonal dependence from east to west in both the northern and southern plains. The monsoon currents are pulsatory in character; once the ground is wet, even in the absence of fresh monsoon from the sea, local insolation gives rise to cloud formation and rain. The south-west monsoon gradually retreats from the region by the end of September or first week of October by which time the seasonal low and its trough are also much feeble or even obliterated. October, however, remains a sticky and more

oppressive sultry month under a comparatively clear sky and the relative humidity still marking high and the moderating rains almost gone (fig. 5.8).

By November the cold weather sets in, with an appreciable fall in both temperature and relative humidity and the humid easterly winds are replaced by the dry north-westerly or westerly winds. The mean temperature in October at Patna is 27.4°C while November and December respectively record 22.5 C and 18.3 C; the same months register 26.6°, 21.0 and 17.0 C respectively at Varanasi.

TABLE 2

Normal Mean Daily Maximum Temperature (°C)

	Jan.	Feb.	Mar.	Apr.	May	June
Bihar (North)	23.3	26.1	32.2	37.2	37.8	35.0
U. P. East	23.3	26.1	31.7	37.8	40.0	37.0
U. P. West	21.7	34.1	30.0	36.7	40.0	37.8
	July	Aug.	Sept.	Oct.	Nov.	Dec.
Bihar (North)	32.8	31.7	31.0	31.7	27.8	23.9
U. P. East	32.8	32.2	32.8	32.8	28.3	23.3
U. P. West	32.8	32.2	32.8	32.8	27.7	23.3

Normal Mean Daily Minimum Temperatures (°C)

	Jan.	Feb.	Mar.	Apr.	May	June
Bihar (North)	10.0	12.2	17.2	22.2	25.8	26.1
U. P. East	8.9	11.1	15.6	21.7	25.6	27.2
U. P. West	7.8	10.0	14.4	20.6	25.0	26.7
	July	Aug.	Sept.	Oct.	Nov.	Dec.
Bihar (North)	26.1	25.6	25.6	22.2	15.0	10.6
U. P. East	26.7	26.1	25.0	20.0	12.8	8.9
U. P. West	26.1	25.6	23.3	17.8	11.1	7.8

January is the typical winter month; the mean temperature ranges between 16.6°C in N. Bihar Plain to 16.1°C in Eastern U. P. Thus, the normal January temperature increases from west to east—Varanasi, Patna and Bhagalpur recording 16.5, 17.3 and 17.9°C respectively in South Ganga Plain while in N. Bihar and Sarayupur Plain of U. P. also the same west to east increasing trend is obtained as is shown by the January records at Gorakhpur (16.4) and Darbhanga (16.8°); Motihari which is a more northerly station, records lower (15.9 C) temperature. The bright sunny winter presents one of the finest weather regimes in the world, although the serenity of the

season is occasionally disturbed by the cold wave and relatively more cloudy but light rainy weather caused by the shallow but extensive Western Depressions, numbering on an average 2 in November, 4 in December and 5 each in Jan. and Feb. The minimum temperature falls as low as 4.5 C or even 4 C at Varanasi during the cold wave, and causes much injury to such Rabi crops as peas, *mushr*, mustard etc., by the incidence of killing frosts during nights. In general, the frost hazards average 5 to 10 days in Eastern U. P. and 3 to 8 days in Bihar Plains. Normally, the mean minimum records below 10°C in N. Bihar Plain (Purnea 8.8°C, Darbhanga

10°C and Mithihari 8.9°C), and Eastern U. P. Plain (Gorakhpur 9.9°C and Varanasi 9.5°C) and above 11°C in S. Bihar Plain (Bhagalpur 11.8°C, Patna 11°C). The winter rain is highly welcome and beneficial to the rabi crops as its effectiveness is enhanced by the prevailing low temperatures and the low intensity of the showers. The copious dew formation in the early dawn hours in the season, due to the saturated air, performing the function of gentle rain by moistening the vegetation, and greatly benefits the crops.

By the end of February and practically by March the temperatures tend to increase because of the hot weather—a season of continuously rising temperature accompanied by falling humidity and pressure till May records the highest temperature, ranging from 26.4°C in the east and north-east Bihar to about 32.8°C in the East U. P. Plain. Thus, the trend of temperature becomes just a directional reversal, as in the winter the temperature decreases from east towards west, it increases from east to west in summer. At Patna, Darbhanga, and Gorakhpur the records are 32.8°C, 32.6°C and 32.5°C respectively. Records are also of course at Bhagalpur (32.0°C), Patna (32.5°C) and Varanasi (34.2°C). In south, the temperatures are increase from south to north and the Saranpat, Patna and North Bihar Plain are cooler, owing to the proximity of the Himalaya than the South Bihar and south-west part of the East U. P. Plain.

The rainfall during the pre-monsoon season (March-May) ranges from about 45 cm in Eastern U. P. to 7.12 cm in Western Bihar. Patna is about 10.28 cm in eastern and about 25 cm in north-eastern Bihar, where it favours pre-monsoon. The hot weather season damages the mangoes and Jambos that ripen and fall before in North Bihar which are through pre-monsoon, but the accompanying rains are beneficial to the existing fruits and root crops to some extent as also for the timely preparation of kharif fields.

The physiologically more significant absolute mean maximum temperature for May reaches over 40°C in the East U. P. and S. Bihar Plains as recorded at Varanasi (41.8°C, Gorakhpur (39.0°C), Patna (36.9°C), Bhagalpur (36.5°C), while

North Bihar Plain records less than 38°C (Patna 35.1°C, Darbhanga 36.4°C and Mithihari 36.5°C). The lower temperatures towards the east are mainly due to the higher humidity "in that direction under the influence particularly of nor'-Westers showers". In general, the typical summer months (April and May) are characterised by hot sun over the long day with hot westerly (or) winds after the morning hours and occasional afternoon dust-storms or thunderstorms (particularly in eastern Bihar under the impact of nor'-Westers) showers due to local heating, resulting in decrease of temperature and giving some relief. Although these storms are the chief sources of pre-monsoon rain, they also bring hail-storms. "The higher humidity, lower temperature and relative absence of dust in Bengal and Assam led to abrupt discontinuance of the Ae winds (particularly) east of Bihar."¹⁰

Even the annual amount of rainfall it could be thought that the region is 'on the safer side', almost free from drought for agricultural purposes, but the actualities are quite different. Droughts, particularly in the western part, are fairly frequent, and also the occurrence of the region is by their irregular occurrence. When the monsoon fails to set in from June to mid July, the crop losses are considerable and in some years the losses are even more. About 90% of the total annual rain is concentrated in the monsoon season and the rest of the year is comparatively drier. The monsoon rain commences during the middle of June, lasts about two months, is periodic in its activity in its intensity, and it rains more than once that month of what falls during 25 or more days during the monsoon. Thus the rain of the monsoon is not rain for the whole of the month and for certain it varies when it rains more. The monsoon is generally lighter in the N. Bihar than in the south-east Bihar. The rain has shown continuously that the rainfall is 1,100 mm in Patna, 1,000 mm in Bhagalpur and the previous monsoon varies from 500 mm to 2,000 mm depending on various factors¹¹. The onset of the monsoons may be sometimes too early, two or more weeks earlier than the usual time or may fall behind by the same margin.¹² Moreover, the monsoons may give a wide gap

causing drought, too long for a successful crop,³⁴ and when the crops are half-parched as a result, the immediate rainfall may be sudden and heavy enough to affect the remaining crops through floods, or else, again, the monsoon may end abruptly or earlier, failing the crucial *Hathia* rain, so essential as the last dose to the flowering paddy crops, resulting in considerable crop damage and causing difficulty in the *rabi* sowing because of lack of moisture in the soil; sometimes it may tail off well into late October causing disadvantageous delay in *kharij* harvesting or *rabi* sowing and sometimes resulting in floods. Thus, the sowing or cropping season remains quite uncertain. The coefficient of variability of annual rainfall in Eastern U. P., based on records of 50 years, is 23%, which decreases eastward.³⁵

From the map (Fig. 5.8) it is obvious that almost the whole of the Middle Ganga Plain

is a region of moderate to fairly high rainfall (above 100-150 cm) except in the western fringes with somewhat less than 100 cm; towards north and east the rainfall increases gradually, and, indeed the region touches the per-humid zone of the Lower Ganga Plain in the NE, a 200 cm regime. Over the greater part, however, the rainfall ranges between 100-120 cm. The higher amount towards the north-east is partly due to the proximity of the Himalaya and partly to the nor'westers. The Himalayan proximity is also partly responsible for more rain in the northern fringe due to condensation resulting from the ascent of the air currents. Bath area (below 100 cm) in Patna district gets rather the minimum in Bihar Plains as an exception, while the contiguous Saran, south Muzaffarpur, Patna, Gaya, Shahabad and Monghyr also remain below 120 cm, decreasing west of Varanasi to below 100; towards the south the rain increases.

TABLE 3*

	Rainfall in cm		No. of abnormalities			Limit for defining abnormality
	Normal (1940)	Mean deviation	Floods	Droughts	Total	
Bihar (North)	102.5	16.25	7	8	15	10
U. P. (East)	87.5	16.00	10	7	17	10
U. P. (West)	82.5	15.75	4	8	12	10

*The years in which the actual rainfall exceeds twice the mean deviation are the flood years and those in which the actual rainfall was less than the normal by more than twice the mean deviation are the drought years.

Apart from the positional contiguity with the Himalayan or southern Plateau area, the distribution of monsoonal rainfall much depends on the axis of the seasonal trough of low pressure, which oscillates between the southern (the southern plateau and the hill ranges) or northern (nearer the Himalayan zone) parts of the region under the impact of the nature, frequency and tracks of the infiltrating Bay depressions and their frontal coincidence with the feeble Arabian currents. This convergence naturally causes heavy rainfall in the region as also subregional variations; "the axis of the trough where the front meets the ground is a zone of smaller precipitation because here the ascending air is still too low to

cause rain. This probably explains the relative dryness of the Gangetic axis."³⁶

As evidenced by a study of 76 years (1875-1950), every two to three favourable-year-period is alternated by one or two unfavourable years in course of a four or five year cycle. The favourable years are, however, seldom bumper years for the poor farmer with limited holding and resources while the unfavourable years smother him out of all joints.

Soils

Apart from the undifferentiated soil of the Siwalik fringe zone in Champaran district, most of the region has broad alluvial soil cover (Fig. 5.9). The alluvials of the plains have undergone

but little pedogenic evolution since their deposition by fluvial agency in the sub-Recent times. These are still largely immature and have not developed any characteristic soil profile, or zonal differentiation, particularly in the *Khadar* and *Bhar* lands. Since these have a common origin and almost identical ecological environment, they show, in general, minor variation in colour, texture, porosity and moisture content etc., but the topographical and drainage differences have brought significant changes in soil morphology. They differ in texture and consistency from drift sands through rich loams and fine silts to stiff and heavy clays which are ill-drained and are sometimes charged with injurious accumulation of sodium salts, producing sterile deflocculated

conditions resulting in *usar* soils.³⁷ The soils are rich in mineral and organic plant foods. There is, however, a serious deficiency in nitrogen, which may be made good by the use of compost manures and fertilizers.

Alluviums are divisible into *khadar* and *bhangar* throughout the Great Plains and elsewhere with different terms. The former, newer in age, covers the flood-plains in the vicinity of rivers including the lower reaches of smaller rivers and also the old beds, and is replenished annually by new deposits. They naturally remain moist and derive moisture from the rivers through seepage in dry period and are capable of growing crops without irrigation. They mostly consist of fine silts but may be sandy in places, as along the Ghaghara and the Gandak

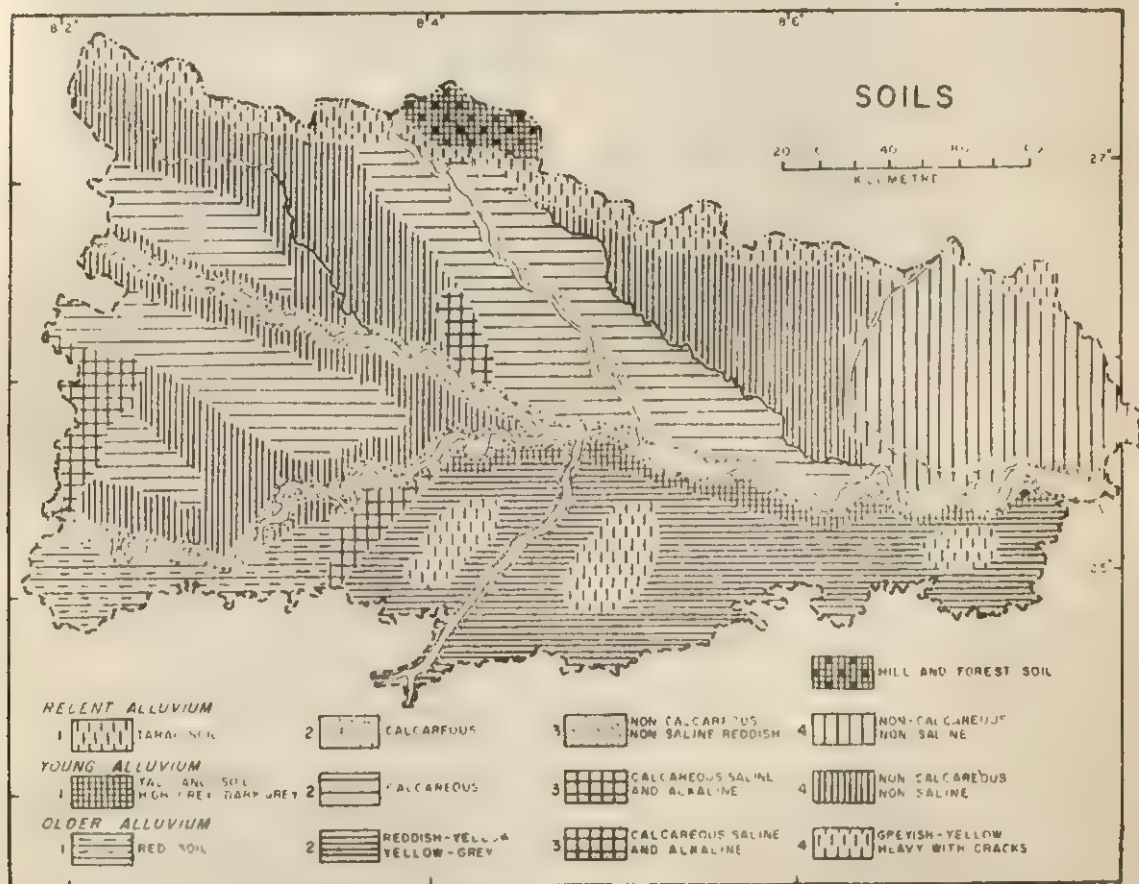


Fig. 5.9

or the Son. Because of the better drainage, except in river beds, newer alluvial soil contains a low percentage of humus and nitrogen and little lime. Being more sandy or silty, it is highly friable and is rich for the *bhadai*, *rabi* and *zaid* (especially root) crops and such annuals as sugarcane. Where it is underlain by hard pan, and contains more silt than sand, it is also suitable for rice cultivation.

The Bhangar is the older alluvium and covers the upland tracts beyond the annual flood limit in the valley flats. Unlike the *khadar*, it is under the process of denudation and contains patches of *usar* infestations, increasing towards the western portion of the Ganga-Ghaghara doab. The formation of *Kankar* or nodular lime concretions through capillary action is also noticeable; they are usually quarried for road building. An impervious clay layer is found in the sub-soil which is important for the construction of wells, so essential in these tracts for irrigation, but it has its disadvantages too in obstructing drainage and creating hard pans with resultant water-logged tracts and giving rise to alkalinity and salinity. The *Bhangar* soils grade from *balua* or sandy to clayey loam, but are often heavier with higher clay factor in depressions. As such, it is sticky and is usually not well drained; it is richer in lime content and *kankar* than the *khadar*. It is more suitable for rice cultivation as it holds water with its hard clay pan.

The *Bhat* or calcareous soil of the eastern Saryupar and central-western North Bihar Plains in the lower Gandak valley is a chemical variant of the alluvial soil. It is white in colour, riverine and low-lying but well drained, good for tilth and highly fertile, containing as high as 25 to 30% of lime, a particular asset for growing sugarcane. The sub-soil is infested with beds of *kankar*. "The probable causes of conspicuous lime proportion seem to be poor subsoil drainage owing to impermeable strata below and lower rainfall than in the adjoining areas. The clay has not undergone a marked translocation from the surface to lower layers and leaching is retarded leading to the accumulation of calcium carbonate in the surface soil."³⁸ Agronomical evidences show that the organic matter and the nitrogenous

contents of these soils decrease rapidly with depth.

Another variant of the alluvial soil is the *Tarai* soil, extending from the narrow tarai zone of the Champaran district (N. Bihar) through a 15-30 km northernmost strip in Deoria, Gorakhpur, Basti and beyond to the west, sharing with Nepal Tarai down the pebbly *Bhabar* zone. Owing to high rainfall (over 120 cm) and almost continuous seepage of water from the Bhabar zone and highly riverain nature of the tract, these soils have developed under constantly moist conditions. They are highly leached heavy clayey soils, and provide moist conditions for rich rice crops. Once overgrown with forests and tall grasses they are being reclaimed fast for crop land use. In fact, now the Tarai is a constantly shrinking zone being pushed northward through reclamation.

Natural Vegetation

An almost unhindered human occupancy for over three millenia of years and centuries of plough and pastoral culture has induced the natural vegetation in the region except in the northern part of Champaran and pockets of the Tarai and some river banks. With a moderate rainfall and fertile soil the region is a natural habitat of a dense forest cover of *Sal* and other species like *Shisham*, *Jamun*, *mabna*, *ber* etc. Even up to the 1840's a large area of the Saryupar was densely forested, and so also were the banks of the Rapti, the Ghaghara and other rivers. There were sizeable pockets in South Ganga Plain. The remnants of the once extensive sal forests are found in northern Gorakhpur, Saharsa and Purnea districts. Elsewhere, the induced vegetation is seen in the form of a savannah with grasses and bushland dotted with trees of different sizes. The village wastelands or vacant places are covered by naturally-growing trees like the *peepal*, banyan, tamarind, *mabna*, *neem*, *babul*, palmyra, date-palm, *abak*, etc., while such grasses as *bher*, *moonj*, *kans*, *jhan*, etc., are found in the *diaras*, Tarai or other low-lying areas, and the more omnipotent *dub*, *motha*, and other less pervasive types are found in the cultivated fields and mounds or field-boundaries and left-over lands. The planted fruit orchards and groves of trees consist of mango,

jambun, guava, *mahua*, jack-fruit, plums, lemon, etc., and also timber trees like *shisham* etc., while bamboo clumps grow around and within settlements. Also such thorny-bushy plants as the *senbur*, plum bushes etc., grow on waste or neglected lands, but the former is sometimes planted for fencing farms or orchards.

The Champaran forests are classified as (1) Siwalik sal, (2) Moist (Gangetic) high alluvial sal and (3) Gangetic moist deciduous riverain forest.

There is some difference in vegetal cover north of the Ghaghara and the Ganga on the one hand and to their south on the other. The groves and orchards, marshy vegetation etc., are more frequent, particularly in N. Bihar Plains. In the south, there is more open parkland vegetation and the frequency of groves decreases and isolated trees are more common. *Sabai* is the most important grass of the region, particularly in the north.

In most of the districts like Ballia, Ghazipur, Jaunpur and Azamgarh in the lower Ganga-Ghaghara Doab and Saran, Muzaffarpur, Darbhanga and Saharsa in N. Bihar Plain, forest cover is particularly non-existent (below 0.01 of the total area of the district), while in most of the others it is negligible (below 1%) as Purnea (0.09), Pratapgarh and Faizabad (0.11), Deroia

(0.23), Sultanpur (0.41), Patna (0.83) and Basti (0.91). In the Saryupar, some parts of the more humid and riverain, northern tahsils and other detached pockets of Gorakhpur, Gonda and Bahraich districts have appreciable forest cover and swell the district figures in percent of the total area to 8.7, 9.1 and 14.3 respectively, while Champaran also gets a significant forest cover (10.92%). In the districts south of the Ganga, the forests occur mostly outside the plains

Ground Water

The Middle Ganga Plain with adequate rainfall and generally porous alluvial soil cover seems to have adequate storage of ground water, but needs scientific survey to locate and measure their incidence and tapability. This reservoir occurs in the aquifers and water-bearing sediments. The water-table is generally lower in the newer alluvium, particularly in the river levee zones where the sandy nature of the subsoil allows greater sinking of the water than in the clayey interfluvial areas of older alluvium. The water table varies from 3 to 20 m, being particularly high in tarai zone. There also exist somewhat artesian conditions, probably at a depth of 60-65 m below the surface, and actually some artesian wells have been sunk in the U. P. Tarai (Fig. 5.10).

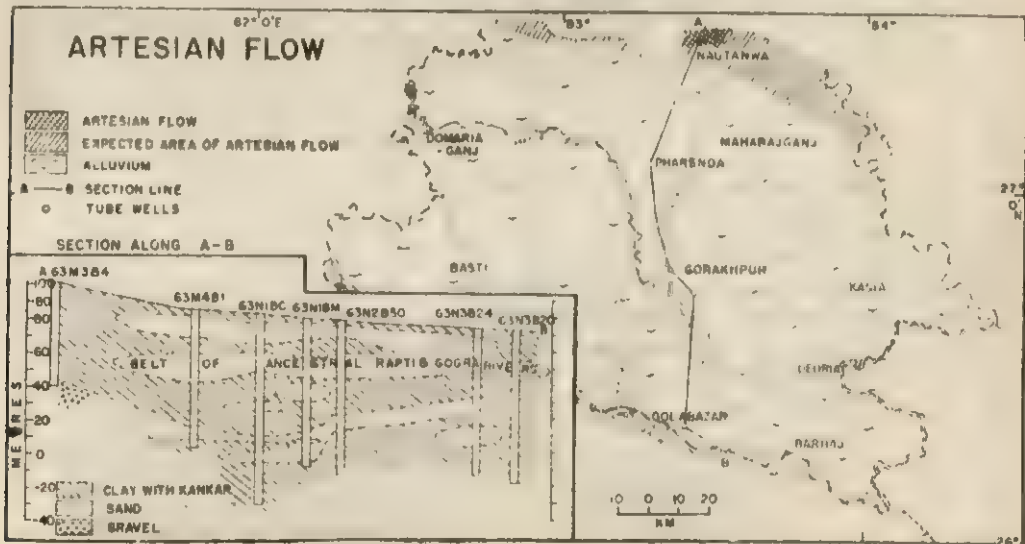


Fig. 5.10 : Geohydrological conditions in the Tarai area

It has been found that many tube-wells dry up after a few hours of use because these have been bored without proper survey. A number of resistivity soundings taken within the Banaras Hindu University campus and adjoining areas have revealed that tube-wells dug with proper

surveys of the aquifer zone could help much in the proper location of tube-wells (Fig. 5.11). From the sections (Fig. 5.12) of 12 tube-wells in the Azamgarh district it is obvious that the depths of the aquifer zones vary widely.

DEPTH CONTOURS FOR THE TOP OF AQUIFER IN B. H. U. CAMPUS

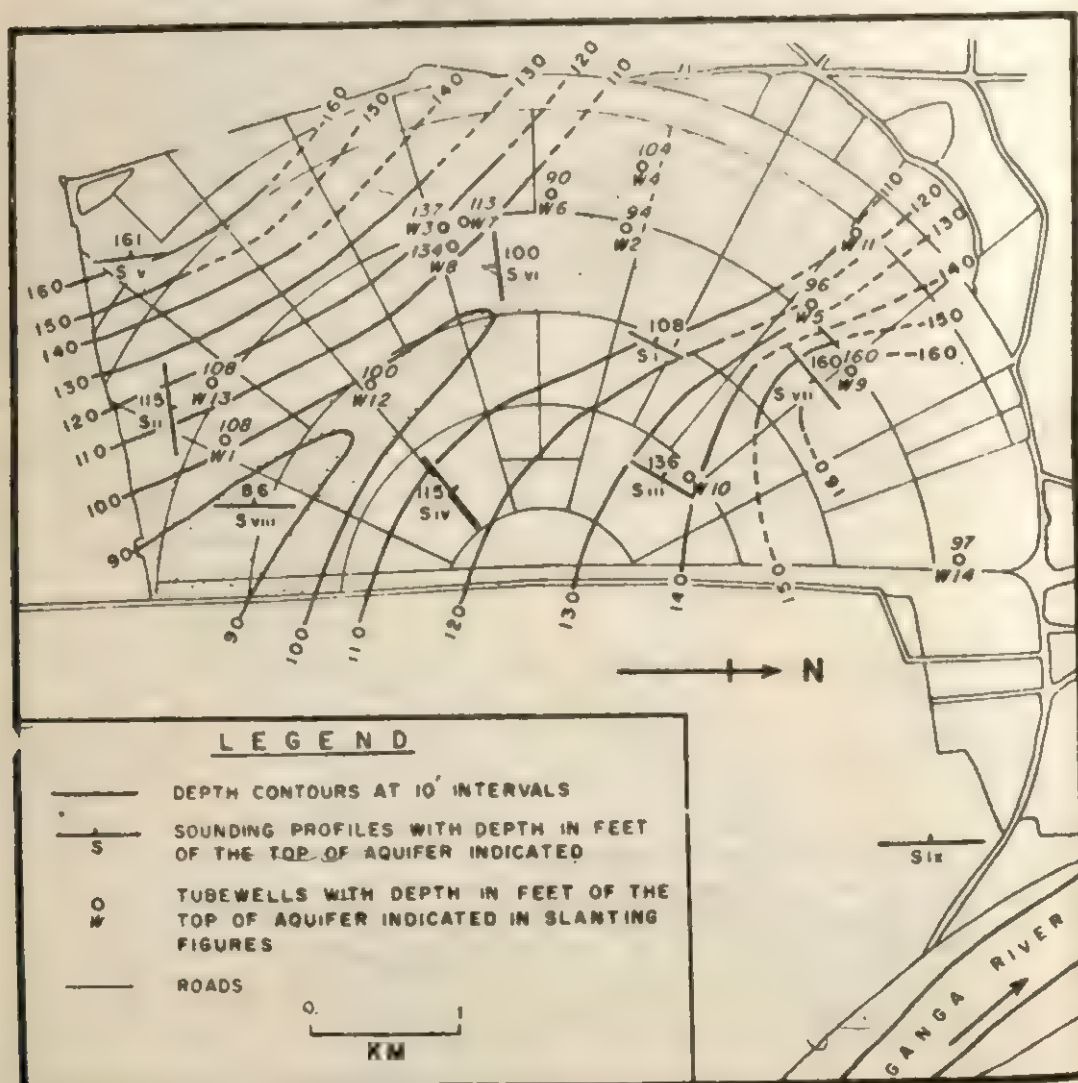


Fig. 5.11

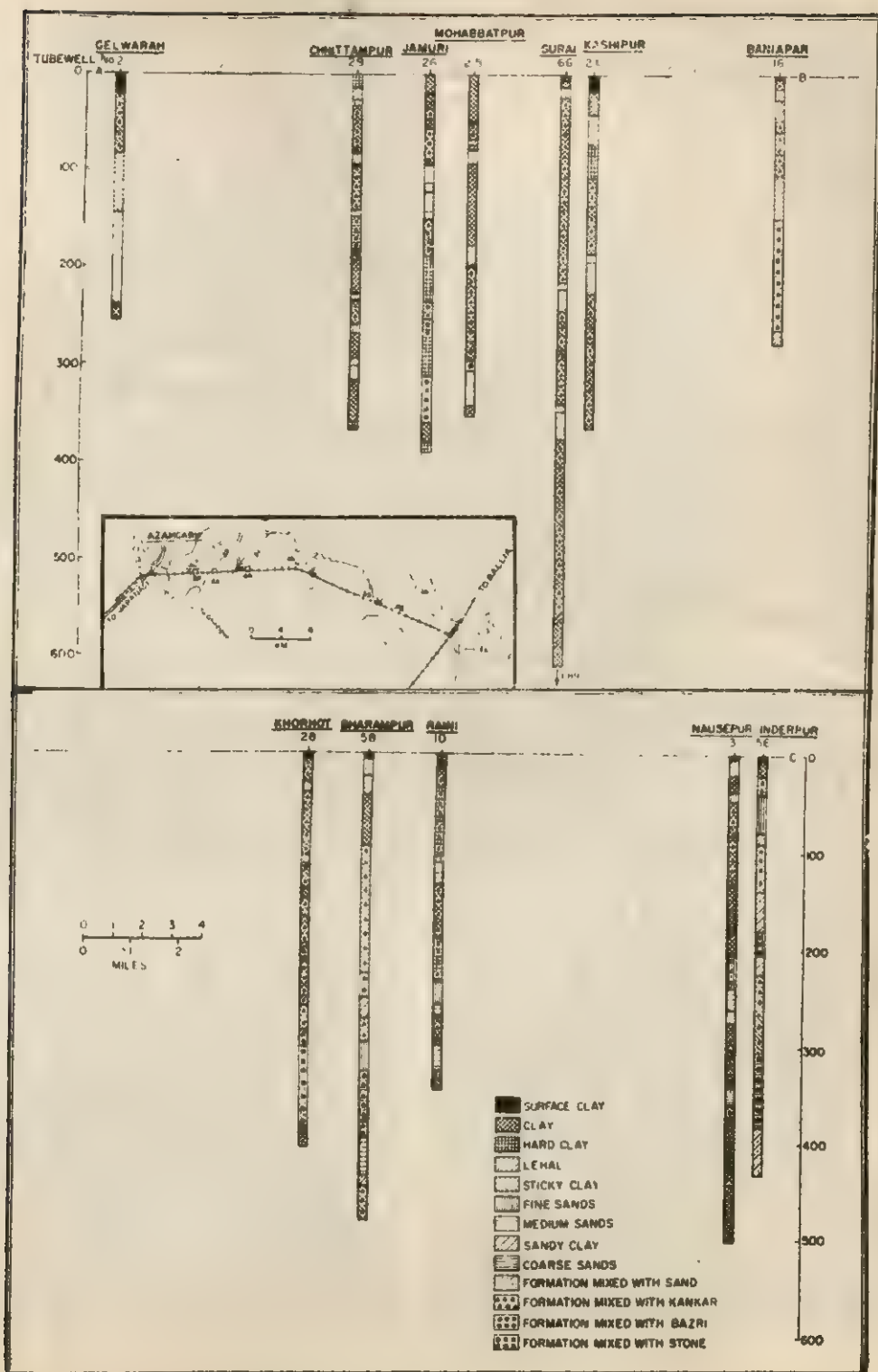


Fig. 5.12

Physical Resource Base

As is obvious from the foregoing, the region primarily derives its resources from the rich fertile soils and surface and ground water resources of the vast plains. Again, it has vast human resources enriched by a cultural heritage of millennia of years. Yet the region is one of the poorest and most under developed parts of the country; peculiarly enough, it is also poorer than the Upper as well as the Lower Ganga Plains although it has neither the scarcity of water as in the former nor the excess as in the latter. The region reflects, in essence, all the problems of underdevelopment in the country in an acute form, though its economy, which has to be essentially agricultural and agro-industrial, can be made viable and healthy.

The region, like its eastern and western counterparts, is endowed with a vast, well drained and almost isotropic land with one of the richest soil cover in the world. With its all the year round growing season and adequate annual rainfall, it can grow a variety of food and industrial crops with the aid of supplemental ground and surface water resources to be stored and channelised in the rain-deficient months or seasons. The region suffers from droughts and floods almost alternately and the twin-ills, in addition to soil erosion, can be easily remedied by the introduction of a well-articulated irrigation-cum-drainage system and reafforestation and land management schemes. The region has, from times immemorial, developed an indigenous system of tapping the upper surface water resources through wells, and at present hundreds of tube-wells are constructed to utilise the vast, deeper channels of the rich ground water reservoir. The forest cover is inadequate; which has not only led to appallingly short-supply of fuel wood and timber but has also accelerated the process of soil erosion and drainage disability. Only some pockets in northern tarai and small patches elsewhere are natural vegetal cover. By destroying the local forests and woodlands on the village commons or wastelands and inter-village boundary lands, the plains people, for the most part, have deprived themselves of their local fuel wood and timber supply for their domestic and agricultural needs, though

the bamboo, and such individual trees as mango, mahua, jack-fruit, plum and shisham are available in private possessions, rendering some service for timber. At places, long grasses and cane-like reeds grow which are utilised for making furnitures, containers and similar equipment for local use, and as thatching materials.

The mineral wealth is rather negligible. Clay and sands are found for making walls through dried cakes or backed-bricks, for potteries and tiles while the *kankar* is utilised for making roads as well as manufacturing some lime.

The Cultural Setting

Population

With a total population load of 55.95 million (1961) on an area of 144,961 km², the Middle Ganga Plain is conspicuous on the population map of India, particularly in view of the incidence of very high overall density of about 384 persons per km² as compared to that of U. P. (250), Bihar (267) and the country as a whole (138), and this with but little urbanism (7.22%). Rarely in the world except perhaps in China or East Pakistan such a high population density with such a high rural base is to be so evenly met with over such an extensive region (Fig. 5.13 and 5.14). It gives a very serious population problem, particularly when we place the staggering population load against the purely agrarian and under-developed regional economy as of now and little possibility or opportunities visible for any substantial migration elsewhere.

The overall density of population is evenly high excepting in the northern Siwalik chunk, southern plateau fringes and a few pockets of the forested and ill-drained *Tarai* and other marshy, highly riverine flood-prone patches and *Khadar* strips of larger rivers and *Usar*-infested patches of the lower Ganga-Ghaghara Doab, which have comparatively lower density. This overall high density reflects upon the overall isotropic nature of the plain, suitability of homogeneously diffused habitability conditions, fertility of soil, drainage conditions, tapability of potable ground water resource through wells and borings, high percentage of arable land and generally good condi-



Fig. 5.13

tions for making a living out of the local and regional resources. In its details, however, the distribution map shows varying and intricate patterns of unevenness, reflecting the diffuseness of highly favourable conditions alternated by less favourable situations, diversity of small facets of terrain, local and sub-regional differences in the richness of such resources as soil fertility, drainage conditions, ground water and other physical, historical and cultural factors affecting the extent and possibility of agricultural and other resource utilization. At sub-regional and local levels such factors as irrigation facilities, cropping patterns, means of transportation and communication, processes of population spread etc., individually or combined, bear upon the population distribution patterning. As the economy is overwhelmingly rural, the patterning of arable land holds the key to the population pattern.

If we include small patches like *ambals* (blocks) the density per km² varies from below 200 to about 600 but the occurrence of such extreme density categories is highly limited in the region.

About half the region, covering a solid block from the Kosi westwards, through the entire North Bihar Plain (except northern Champaran), eastern half of the Satyapar, major portion of the lower Ganga Ghaghra Doab east of Mirzapur-Jaunpur Azamgarh line (excepting Lalgarh and Sandpur tahsils), western and northern half of the South Bihar Plain together with Chandauli tahsil and part of Chakia in Varanasi district carries a density of over 400 persons per km². This density is also found in some other parts of the region as in Bhagalpur sub-division in Bihar and Patna and Patna tahsil in U. P. The hard core of this solid block lies around the Ganga-Gandak-Son and Ghaghra confluence point with well over a density of 500 persons, as is reflected by the district densities of Patna (526), Saran (519), Muzaffarpur (527) and Darbhanga (509). Most conspicuous, however, on the map, are the areas around Varanasi and Patna with over 600 persons per km², inflated obviously because of the extra weight of their eponymous cities. In terms of details, a compact block of 119 *ambals* extending over the

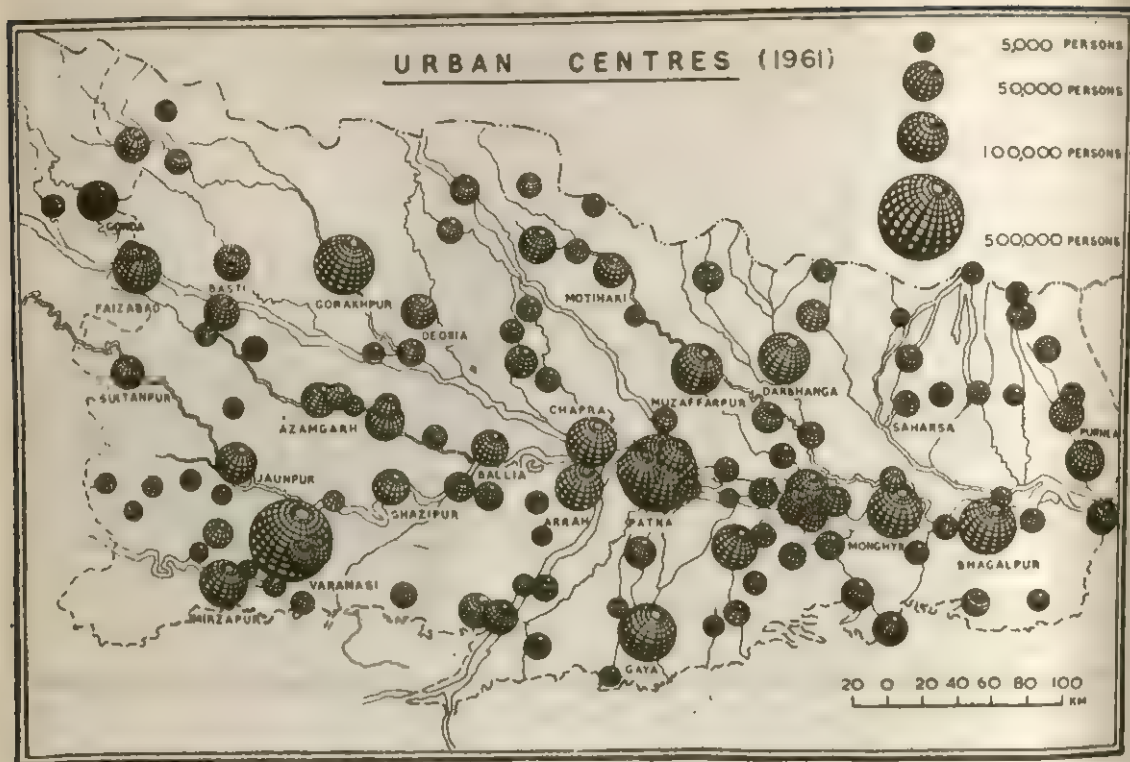


Fig. 5.14

major portions of Saran, Champaran, Muzaffarpur, Darbhanga, Monghyr (north), Patna and Shahabad in Bihar Plain account for more than one-fourth of the total population of the State although they cover only one-eighth of the total area. All the tahsils of U. P. having a rural density of over 450 persons are concentrated in the East U. P. Plain, with the highest in Varanasi tahsil (508). Dobhi block in Kerakat tahsil carries one of the highest rural densities of the world. Likewise, the entirely rural *anchal* of Bidupur (Muzaffarpur district) records 738 persons.

There is a general decrease in density towards the west in conformity with the decreasing rainfall and rather abrupt towards the entire south along the plateau fringes, and varyingly in the marshy and sub-montane lands towards north and the Kosi Plain in the east, mostly because of the erratic behaviour of the Kosi. There is a general decrease from east to west—from Bihar Plain (390) to the East U. P. Plain (375).

The area of low density (below 200) is patchy and is found in three small pockets, in the southern plateau fringes—Meja tahsil of Allahabad, Bhabhua of Shahabad and Jamui of Monghyr. This is because a substantial portion of these areas has thin soil cover, rocky surfaces, lack of irrigation facilities, and hence lower percentage of arable land.

Trend of Growth : There has been a remarkable growth of population during the last three decades : the total regional percentage growth of over 60 during the last six decades (1901-61) is rather much less than the all-India average (85.89) as also of Bihar (70.08). Over four-fifths of the total gain occurred during the last three decades (1931-61). The earlier trends have been sporadic and slow. In fact, the region registered an actual decline in the absolute numbers in the decade 1911-21, when not unlike large parts of the country the region suffered due to epidemics (1911-12), followed by two successive droughts, floods and

famines and the troubles were all the more accelerated by famine, diseases and epidemics (1918-19), specially influenza which "affected the age and sex structure and the depletion of reproductive ages brought down the birth rate." Often the denser pockets suffered the most. Between 1901-21 all the subdivisions in North Bihar Plain except the northern ones (excluding Supaul 4.37) and all the subdivisions of Shahabad and Bhagalpur districts in South Bihar Plain suffered a loss ranging up to 15.49 in Buxar. In other districts some sub-divisions gained a little while some others lost by the same margin. Purnea Sadar (22.75) and Katihar (24.15) gained the maximum in Bihar Plains, while Patna city (-20.00) suffered most. During 1921-31 there was a spurt of growth but the trend was accelerated since the thirties, marking an average annual growth rate of about 1.4% consistently. There was, however, a significant regional variation in growth pattern; while the whole of South Bihar Plain, Kosi Plain and the Champaran district of North Bihar, Gorakhpur and Varanasi experienced 60% growth during 1901-61, Darbhanga, Muzaffarpur, Saran, Deoria, Azamgarh and Ghazipur recorded lower percentage. District-level variations were more phenomenal. While Purnea recorded 96.40% growth, Saran registered only 48.79% much less than the regional average (over 60%). On subdivisional level, Katihar and Patna Sadar recorded 148.97 and 178.49% growth while Supaul (29.84%) registered the lowest. In fact, Supaul sustained losses during the entire 1901-51 period and gained 36.40% during 1951-61, a direct result of the containment of the Kosi in the area.

Reclamation of *tarai* tracts in Gorakhpur, Champaran and other areas, arresting of floods in the Kosi Plain, and introduction of irrigation facilities have led to agricultural settlement stabilization and economic prosperity, thus leading to consistent population growth, particularly during the post-independence period. The high urbanisation rate in some areas and a remarkable decline in death in general and better health facilities have also been contributory to this trend.

Population Structure : There is a wide variation in sex structure, both regionally and in terms of rural and urban areas. The entire western half of North Bihar Plain, covering Darbhanga (1,059), Muzaffarpur (1,047), Saran (1,137), and most of the contiguous Ganga-Ghaghara Doab-Ballia (1,035), Ghazipur (1,020), Azamgarh (1,032), Jaunpur (1,061) and Sultanpur (1,017), and Deoria (1,002) in Sarayupur Plain form a solid block of high sex ratio ranging from 1,002 to 1,137. All these districts are important in exporting their male sections to other parts of India for earning their living while the female folk remain at home. Among the remaining areas the Kosi Plain (Saharsa 944, Purnea 922), and most of South Bihar Plain, Bhagalpur (951), Monghyr (989), Shahabad (985), major portion of Sarayupur Plain and remaining parts of Ganga-Ghaghara Doab have lower ratio.

It is notable that the rural sex ratio exceeds 1,199 in a compact area of 7 *anchals* of Saran district, i.e., Jalalpur, Baniapur, Maunshi, Ekma, Mashrak, Bhagwanpur and Maharajganj as also in Singhwara *anchal* of Darbhanga. This block of very high sex ratio is fringed by high sex ratio zone (1,100-1,199) over greater part of Saran district, mid-western Muzaffarpur and central Darbhanga in North Bihar Plain.

Urban sex ratio is naturally unfavourable in most of the region but it borders to high imbalance in the Kosi Plain (Purnea 724 and Saharsa 793), and Muzaffarpur (777), all in North Bihar Plain, as compared to 811 of urban Bihar. Other districts range from 813 (Patna) to 903 (Monghyr). There are, however, small towns in Bihar Plain with favourable sex ratio, such as Jagdishpur (Shahabad), Hisua (Gaya), Revelganj (Saran), Mahnar Bazar (Muzaffarpur) and Teghra (Monghyr).

The sex ratio has shown notable fluctuations in different areas during last sixty years. The western Ganga-Ghaghara Doab has registered an increase while in the remaining area it has gone down. During 1951-61 the Bihar Plain as a whole improved in sex ratio (990 in 1951 to 994 in 1961) against the trend in the country as a whole (946 in 1951 to 941 in 1961), while in Bhagalpur (961 to 951), Saharsa (949 to 944) and Patna (945 to 937), it has gone down.

About 40% of the total is working population. The percentage decreases to 34 in urban area showing thereby that there are more dependents in urban areas than in the rural area where many of the children of school age also have to go to work due to lack of resources or schooling facility.

Agriculture is the mainstay of the people in the Middle Ganga Plain, engaging over 80% of the total working population. Among the non-agricultural occupations, services and household industries are the leading pursuits registering 6.9 and 6.2% respectively of the total working population, followed descendingly by trade and commerce (2.6%), manufacturing (1.5), mining, quarrying and livestock raising etc. (1.2), transport (1.1) and construction (0.4). The urban occupational structure, however, is naturally quite different, but not so much as in the economically advanced countries; in fact, agrarian activities hold importance in small and medium-size towns and are by no means absent even in large cities of the region. In general, services are by far the most important activity (33.1%), followed poorly by trade and commerce (17.0%), manufacturing (13.6), household industries (13.0). Agriculture engages as much as 10.5% of the urban workers, and exceeds transportation and communication (8.2), construction (3.1) and mining and quarrying (1.5). It is clear that mining and quarrying are not the forte of the urban economy, and while manufacturing is but mostly confined to processing of raw materials or foundry-repair-shop type small engineering, agriculture makes a significant dent in urban economic fabric.

The percentage of urban farming people is inversely related with the size classes of towns, i.e. only 4.24% of the workers are farmers in class I cities (pop. 1,00,000 or over). There is a general increase as the urban orders descend except in class IV (10,000-19,999) group, which has been partaking the general rise in commerce, manufacturing etc., and in some newly developed small towns. Some of the large towns have very strong agrarian base : Chapra-Revelganj (21.6%), Bihar (20.3%) and Jaunpur (17.1%) are notable. Some of the centres, irrespective of size, have

exceptionally strong base of household industry, particularly textiles as in Mubarakpur (80.7%), Kopaganj (71.0), Mau (45.2), Jalalpur (62.2), Tanda (52.2) in East U. P. Plain and Madhubani (29.9), Jhajha (23.6), Nasriganj (21.8) and Daudnagar (20.3) etc., in Bihar Plain.

Urban Population : The region is the least urbanized (7.22%) in the Great Plains of India, and registers lower incidence than U. P. (12.9%) or Bihar (8.4). There is appreciable sub-regional variation in urban population distribution. The South Ganga Plain (11.49) is more urbanized than the Northern Plain (5.7). In the Northern Plain, however, the Ganga-Ghaghara Doab registers the highest percentage, while the Saryupar (including Saran of N. Bihar), Mithila and the Kosi Plains (3.9, 4.8 and 4.9% respectively) are less urbanized. The Magadh-Anga Plain in the South, however, registers the highest percentage (13.4) of all the sub-regions. While the Ganga-Son Divide (7.8) is much less, Varanasi (4,89,864) and Patna (364,594) inflate the urban percentage in their respective areas. Likewise, the urban percentage of certain districts is highly inflated by their large eponymous district headquarters, which happen to be most attractive service, trade and transport centres in the district, and some in larger region, and exert stronger pull for the local capital, labour, skill and enterprise for the establishment of large scale industries than most other centres.

The present century has marked a much higher urban increase (130%) as compared to the general population increase (60%). The trend was sporadic and fluctuating during the early three decades (1901-31) during which the urban population increased hardly by 5%, while it has registered about 125% during 1931-61. From 1930's onwards quite a number of new towns were added from village origins. Trades and services as also the sugar industry have provided a great impetus to town growth. Most of the urban population gains have gone to larger centres for reasons stated above, and the percentage share of small towns in population has deteriorated from over 30% in 1901 to 18.0% in 1961, when larger urban centres shared over 65% (1961). From the 1930's onwards, as many as six towns

of class II (50,000-99,999) have grown to swell the number of class I cities from 2 to 9, while also class III (20,000-49,999) and IV (10,000-19,999) towns numerically more than doubled. Major casualties were the class VI towns (below 5,000), falling from 8 to only one.

It is clear that the process of urbanization has yet to set in on the regional level : the region is a vast rural sea with individual urban centres which appear to provide some semblance of urbanization and urban life. Most others, few and far between, are small to medium size rural service centres, with an appendage of commerce and administration and some professional services and handicrafts, and only some semblance of transport and industrial functions.

Rural Settlements

As indicated in the foregoing, about 93% of the population is rural, living in about 73,562 villages of different sizes. About 40 to 70% of the rural population lives in villages of medium size (Pop. 500-1,999) except in Santhal Parganas (33.4) and Saharsa (37.6). About one-third to one fourth congregate in small size villages (Pop. below 500) in East U. P. Plains except in Ballia and Gonda (both 18.6), while in Bihar Plains there is much wider variation : most of the Bihar plain has hardly 12% of the total rural population in small size villages, and in fact below that in Champaran (9.16), Muzaffarpur (11.04), Darbhanga (6.14) and Saharsa (5.26) districts. Actually in the entire riverine belt of the Saryupar and N. Bihar plain only Basti district marks an exception by registering almost half of its population (49.0%) in small villages. Only Santhal Parganas (62.15) excels it in this respect because of highly broken relief. In the southern plains about one-fourth to one-fifth of the rural people live in small villages.

In the case of large villages (Pop. 2,000-4,999) the spatial pattern changes : while in the East U. P. Plains only one-tenth to one-seventh of the rural population is found in such villages in most of the districts excepting Basti (6.9), in Bihar Plains more than one-third of the total population is accounted for in this group, varying from 16.74% in Gaya and 25.06% in Shahabad

which are partly rocky and hilly to 53.26% and 56.27% in the riverain Darbhanga and Saharsa respectively. In fact, S. Bihar Plains register about 30% of the rural population in this group while Tirhut Division registers over 40%.

Some pockets of the plain, particularly the large *Khadar* levees of the Ganga in Ghazipur district eastwards and of the Gandak, the Ghaghara, and other large rivers (unlike the Kosi and the Son which are mostly shun by settlements) are famous for siting some over-grown villages (pop. over 10,000). Ghazipur is the only district in the region and in U. P. in which about 5% of the rural population resides in overgrown villages; other important districts are Bhagalpur (3.66), Champaran (3.22), Saharsa (2.86), Monghyr (2.56) and Darbhanga (2.44).

One of the notable features of the distribution of rural population has been a significant decrease in the percentage of rural people living in small villages in all the districts except in Jaunpur, Monghyr (1.27%) and Bhagalpur (5.96%) showing some increase. Significantly, the decrease has been consistent since 1901 in most of the districts and has varied from 40 to 90% in most areas : Saran dropped from 44.50 in 1901 to 15.63% in 1961. The low medium size villages (pop. 500-1,000) have also lost in most of the districts except in most of the Saryupar, Ballia, Jaunpur, Sultanpur and Varanasi in the Purbia Plain and the contiguous Shahabad and Gaya areas. This trend indicates the upgrading of the small villages by population gains, and also the fact that new villages are not coming up, perhaps because of saturation in settlement siting. This is also corroborated by the fact that medium, large and overgrown villages also have gained everywhere except in Jaunpur where the medium size villages (Pop. 1,000-1,999) have not gained.

The rural settlement types and their distributional pattern in the region are intimately related to its alluvial morphology and the predominantly agrarian economy. The complexities of the various physical ensembles, viz., geology, relief, drainage, climate, soil, and natural vegetation have profound impact, both attractive and restrictive, on the selection of sites and morphological

plans of the villages, while cultural factors such as the nature of crops grown, population density, nature of transport system and various intangible social customs and traditions and taboos imbibed through millenia of years appear to have guided the orientation and arrangement of clusters of different sizes belonging to different castes and communities³⁹ (Fig. 5.15).

In the Saryupar, the abundance of water combined with the level and fertile plain has given rise to uniform distributional pattern of settlements, but locally this uniformity is disturbed by the nature of channel shifting and size of the streams and the fork lands in between them, the incidence of forests, swamps and marshes, fertility differences of soils and, as in the Tarai, pattern of distribution of lands among the colonizers. The Rapti *Khadar* and *Tarai* where woods have been removed, have large and compact villages,

many being dry-point and water-front settlements along the ox-bow lakes (Fig. 5.16; Inset). Grass- and forest-infested areas in the *Tarai* have unevenly distributed hamlets with a few large compact villages at suitable sites. The vast area in the Kuwana-Ami and the Rohin-Chilua Doabs are featured by uneven distribution of settlements owing to presence of woodlands, marshes and lowlying areas, along the margins of which hamleted villages have grown up. East of the Rapti and south of the *Tarai* (20°N) the hamleted settlements are quite uncommon. Almost evenly distributed small and compact settlements with few hamlets are found in the Rapti-Little Gandak interfluvium, east of which in the *Bhat* soil region the degree of compactness and evenness of spatial patterning increase.

In the Ganga-Ghaghara Doab the distributional pattern of settlements appears to vary from west

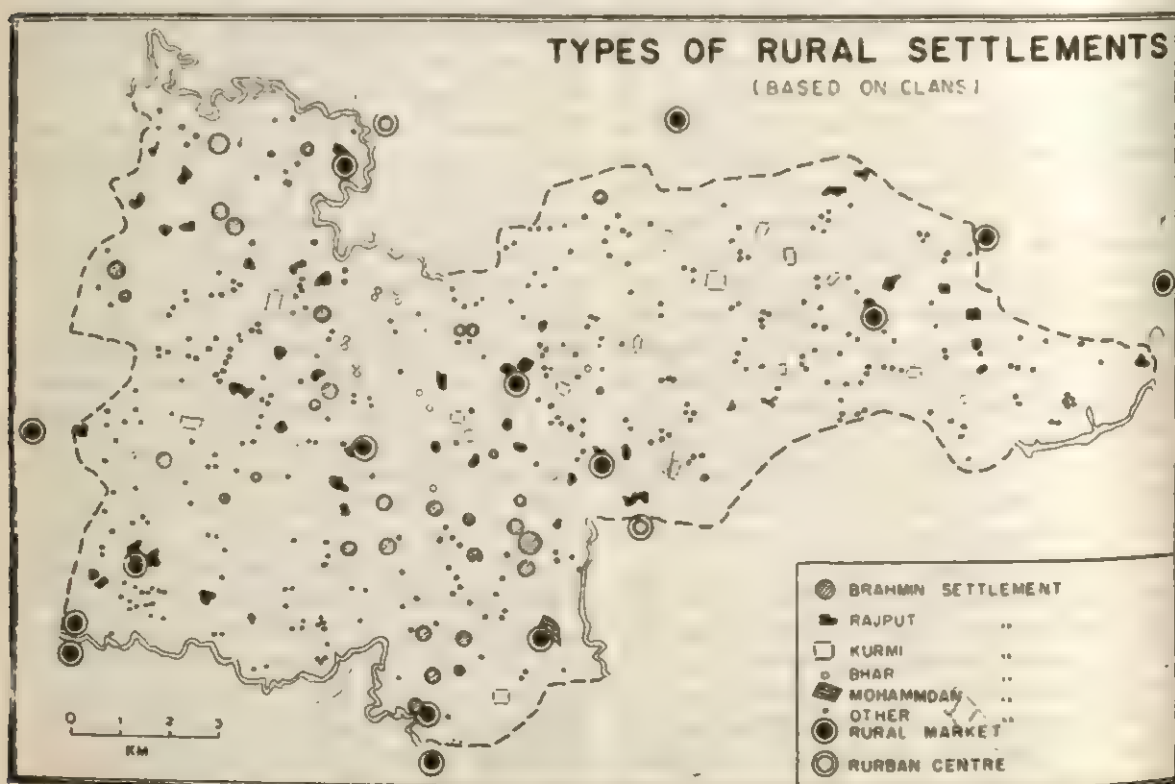
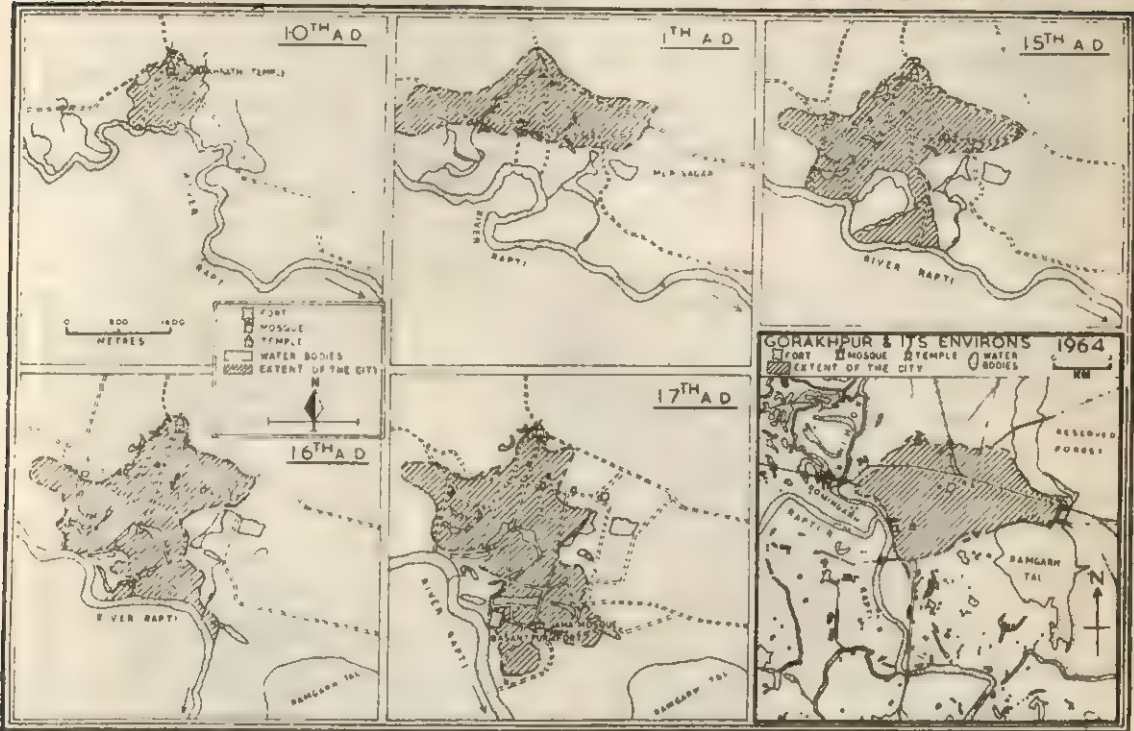


Fig. 5.15

GORAKHPUR

GROWTH IN RELATION TO THE CHANGING COURSE OF THE RAPT



BASED ON HISTORICAL RECORDS, DISTRICT GAZETTEER & PERSONAL OBSERVATIONS

Fig. 5.16

to east and from the *Khadar* to the *Bhangar* in general conformity with the diversities of the natural and cultural factors discussed in the foregoing. On the well-drained loam tracts of the eastern part, excepting the ill-drained *Kachhar* lands of the Chhoti Saryu, hamleted settlements are more or less uniformly distributed. Eastward in Ballia district fairly large and compact villages with a few hamlets have grown up. Many villages are quite ancient in origin and they have imbibed certain elements of the historical corridors in their social milieu. Subhakarapur, north of Ghazipur, located in the *Bhangar* between the Mangai and the Bisu, is an ancient village and has a rectangular site plan (Fig. 5.17). Here, as is usual in most villages of this region, the *Kshatriyas* are the dominant caste, socially and economically, as they form the chief land-owning people, and they occupy the most important

compact site. There are other castes and communities to the east and north-east with overall mixed but carefully separated quarters by village streets which, however small and narrow they may be, serve as much for circulation as for maintenance of social and economic distances. Muslims are on the western side. To the west of Ghazipur-Bahadurganj road several new servicing institutions like school, hospital, etc., have emerged, and there is also a relict of the *nil godam* (indigo godown). Quite characteristic of the taboo against the ancient ruins, it is found that the ancient site remains uninhabited.

Westwards in the vast *usar*-infested tracts of the patchy (though now intensified) cultivation, unevenly distributed large and small villages, depending on water factor and size of cultivated lands nearby, with several outlying hamlets are the general rule. Ravine lands of the Gomati,

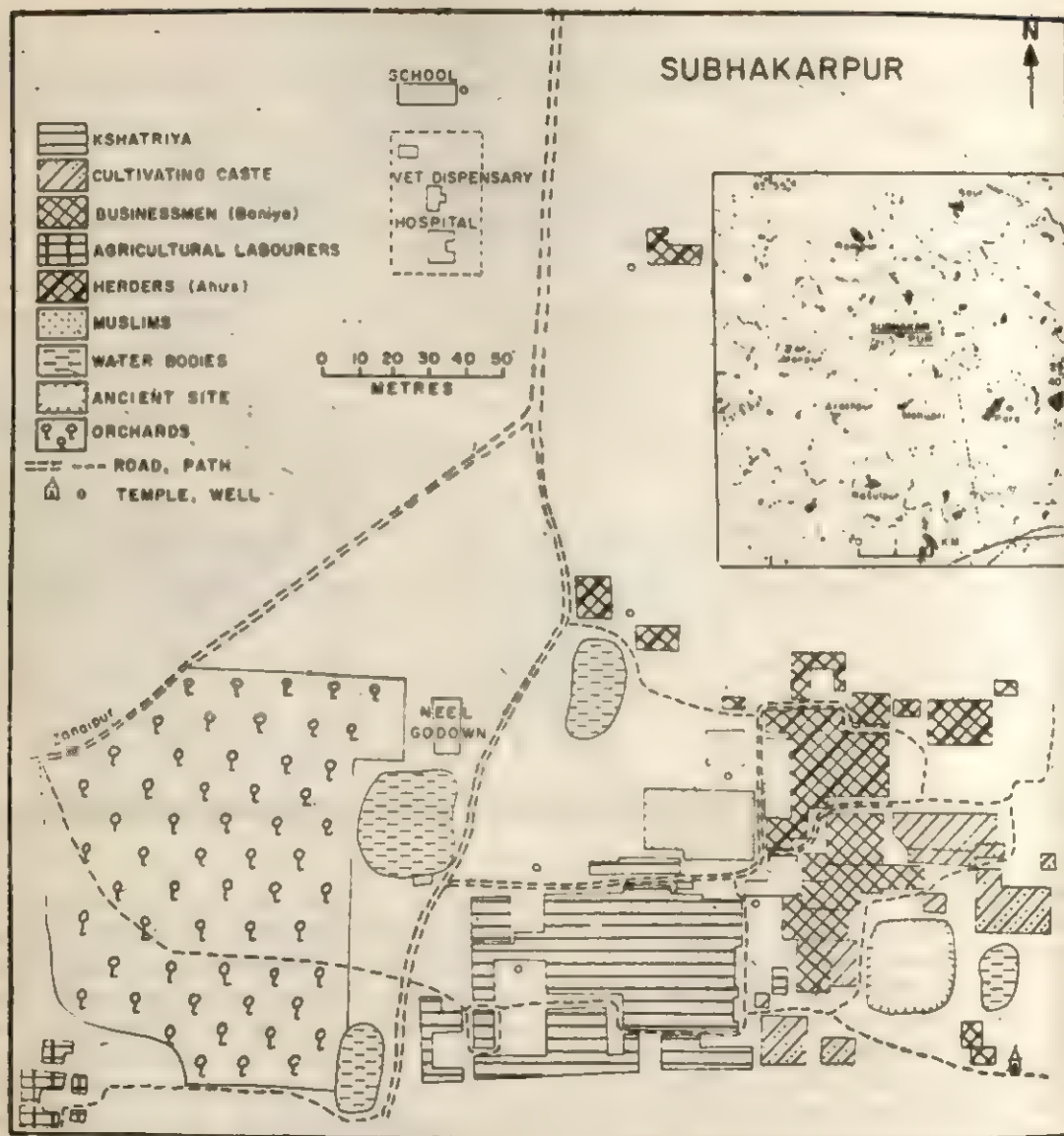


Fig. 5.17 : Morphology

the Sai and other rivers are devoid of settlements as are the *Usar* tracts, and only on their edges with better lands villages have sprung up as if in a line on favourable sites. Under the current phase of *Usar*-reclamation, though on individual scale, hamlets are springing up and even some detached farm-houses might be seen, particularly near the *tals* and other water-points, which phase may be accelerated with the consolidation of

holdings and irrigation facilities through tube-wells or pumping sets.

In the *Khadar* lands, there is a general lack of viable sites, and large out-hill like human congregations are found on the few available dry-point levees. But the *Ghaghara Khadar*, being subject to more ravaging floods and sand sprawls, has fewer large settlements in comparison to that of the *Ganga*, and is densely settled with ham-

lets. The *diara* lands are mostly temporarily settled for growing *rabi* and *zaid* crops, although some of these patches have also large number of small settlements, springing out from the large neighbouring villages : Sitab Diara and Umarpur Diara of Ballia-Shahabad are such examples on the Ganga Diara lands; the latter rocked the whole area by the problem of land disputes, a difficult question in the agrarian settlement in such

lands of shifting character. The Ganga *Khadar* is also characterized by uneven distribution of settlements; its high bluffs which are few and far between have offered sites for some of the oldest and largest villages (with over 15,000 pop.) like Gahmar, Rentipur, Sherpur etc. Some villages are exceptionally large also due to contact-point location between the *Khadar* and *Bhangar* lands. The land immediately behind the levee

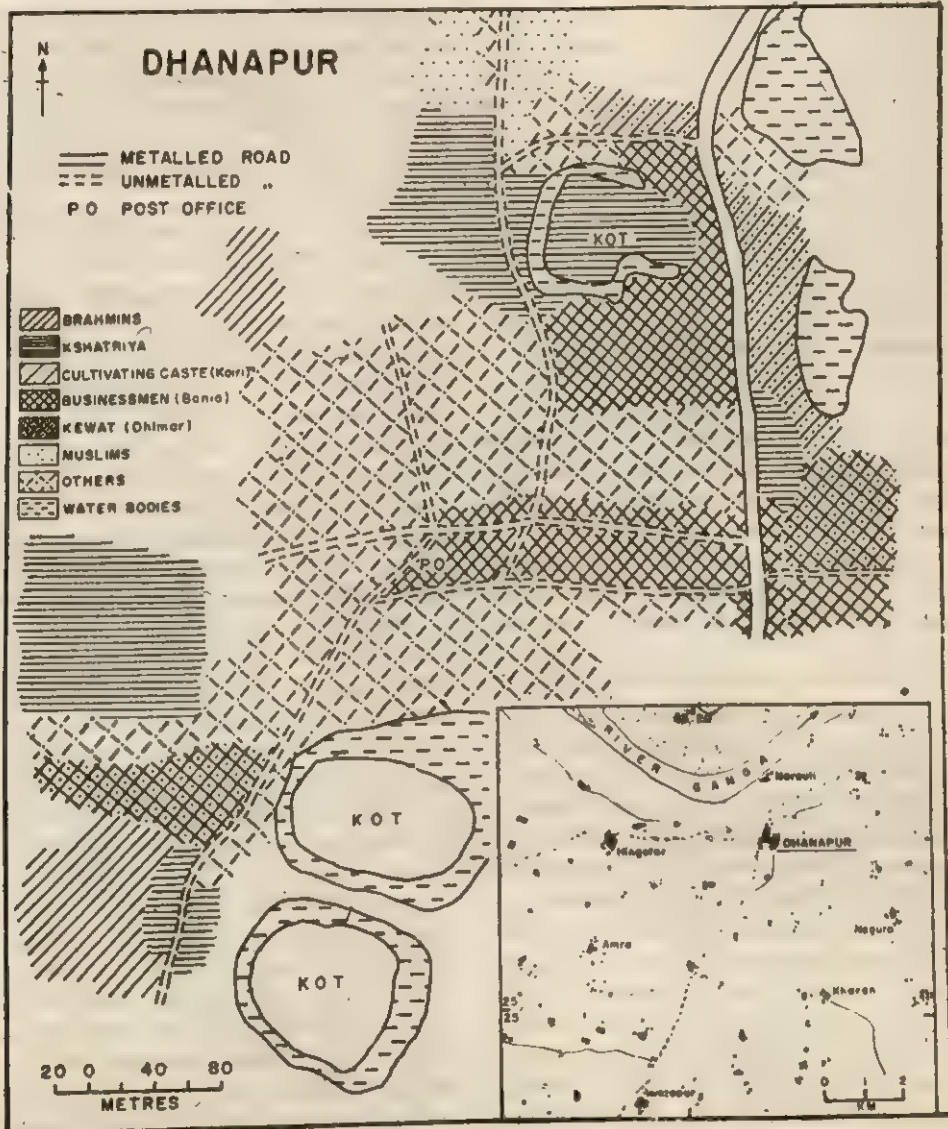


Fig. 5.18 : Morphology

or on the shelving banks opposite are easily inundable and are devoid of settlements for several km. However, temporary hutments dot these lands which support the parent villages due to the high fertility of the silted-over soils for *rabi* crops which compensate the loss of the rainy season crops. The Gangapar Plain above the Ganga Khadar is, in general, characterized by a more or less evenly distributed compact and semi-compact large and small settlements. Dhanapur along with Hingotar (Fig. 5.18) marks an extensive site along the old levee of the Ganga, now followed partly by a road. The village is of ancient origin as is evidenced by the *Kols* (old deserted sites). It is a multi-community village and has developed as a rural service centre with a bazar, Inter. College, police station and some others. The Karamanasa valley with its rice-rich *karail* soil has large and evenly-spaced compact settlements in both the irrigated and unirrigated tracts, while on the *Sikta* (sand loam) tract, particularly in the northern and western part of the area, hamleted villages are common. At the contact-point zone of the southern hills and the Gangapar Plain also, some large settlements have sprung up, and some of the villages were originally fortified or walled, particularly in the Karamanasa Valley.

The settlement patterns and types are different in N. Bihar and S. Bihar Plains because of the differences in the nature of drainage and other factors.

In the Sub-montane Hills and Foot Hill zone of N. Champaran, rural settlements are typically dispersed, settled as they are in small patchy clearings for cultivation in the woods. The remaining part of the N. Bihar Plain is characterized by both compact and scattered types as well as their intermediate variants : while the north-eastern plains have mostly dispersed types, those in central doabs are mostly of semi-compact and compact types, while again the Ganga and Ghaghara Diara lands have dispersed settlements as they do in the East U. P. Plain. In N. E. Purnea, the "agglomerating force of water is minimized because of the plenty of surface water and a high water table" and constant danger of floods retards large human congregations while relative isolation

from the main historic thrusts has provided it enough safety for dispersal. Except the high and safe levees, the hutments shun the river banks and are mostly irregularly scattered over or follow some linear patterning along the levees of dead channels or ox-bow lakes or along some transport route or along embankments. The village Ratauli, (Pipra Block, Dt. Saharsa) for instance, is an elongated settlement along an unmetalled road following a levee of the old course (dry) of the Kosi (Fig. 5.19). The core of the village is inhabited by Kshatriyas, with some clustering of the Banias along the roadside, while Kewats (Fishermen) are quite significant. The labour class is towards the south at some distance along the road.

In the Ganga-Burhi Gandak Doab (away from the Ganga levees) also has developed an "island" of relatively dispersed settlements" characterized by small hamlets and scattered hutments dotting over the isotropic landscape of "amazingly uniform fertility of the loamy lowland liable to frequent inundation"⁴⁰ relatively free from marshes and other negative lands. The remaining parts of the Bihar Plains covering most of the S. Ganga Plain, SW Purnea, S. Saharsa, N. Monghyt, remaining parts of Champaran, Saran, Muzaffarpur and Darbhanga have developed, like their E. U. P. counterparts, compact human clusterings, for most of the reasons stated above. The basic components of such factors have been the critically important potable water factor, traditional need for cooperation as much for varied agricultural needs such as irrigation, trading etc., as for social, politico-strategic, economic and cultural solidarity, including collective responsibility for resource management and use and the uniformly available fertile soil.

The Mithila Plain shows wide variation in the settlement patterns and types. Village Vaishali and the surrounding plain are located in the lower Gandak valley. The area is characterized by linear sprinkling of settlements with large interceptions of vacant lowlands which are cultivated (Fig. 5.20). The village is one of the most ancient villages of this plain and is located south of the vast ancient *Garh* (ancient sites girdled by a

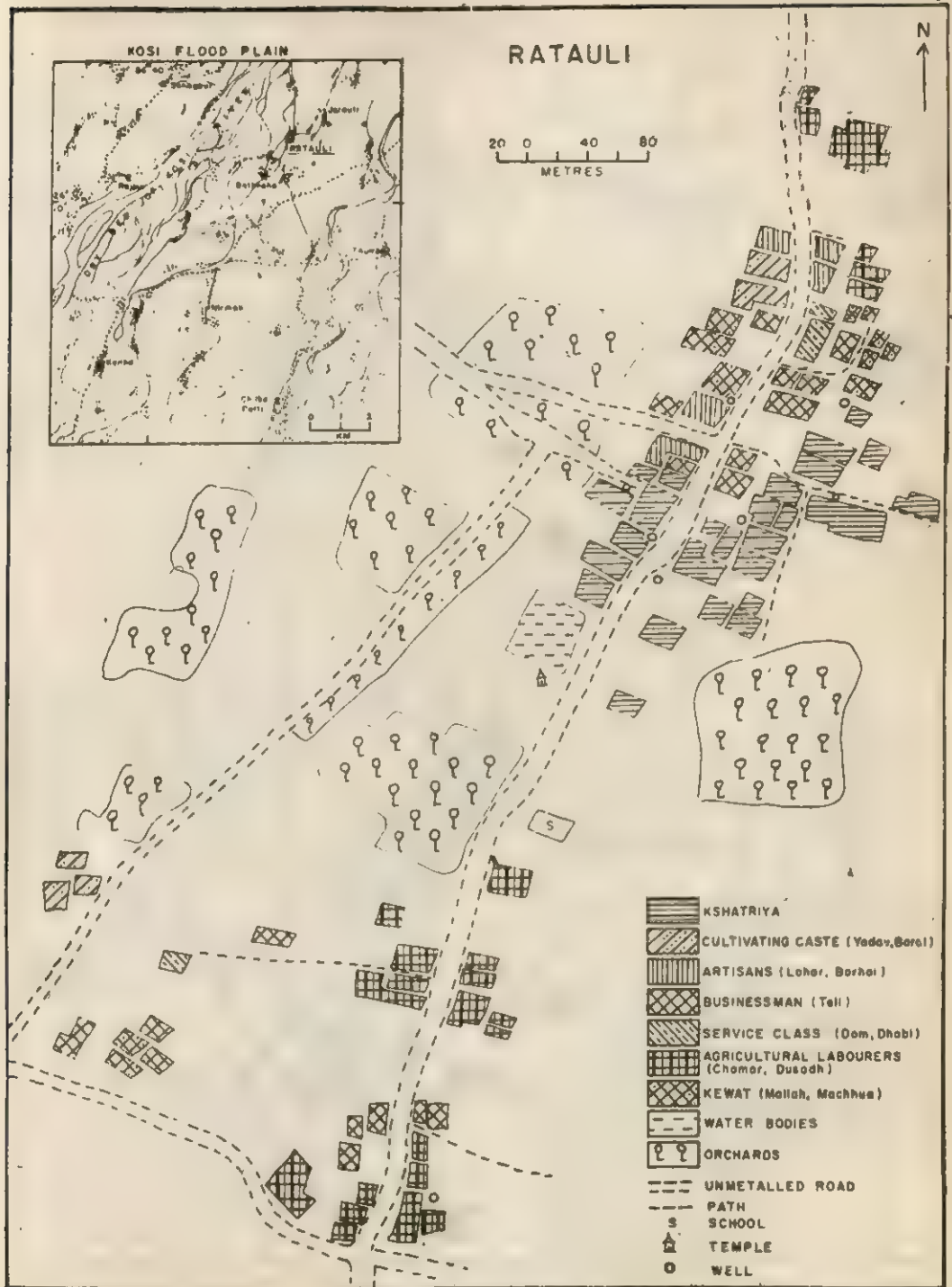


Fig. 5.19 : Morphology

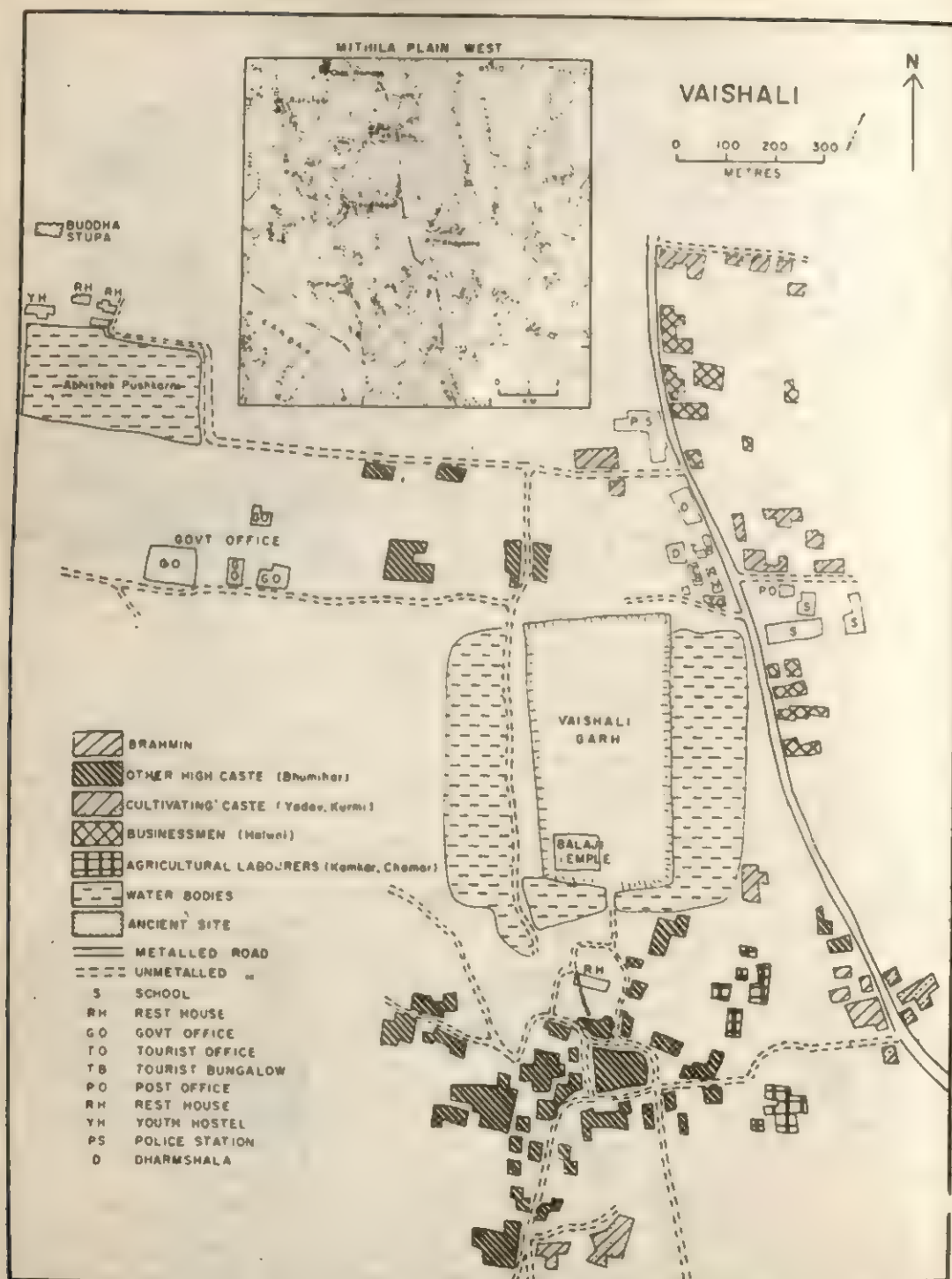


Fig. 5.20 : Morphology.

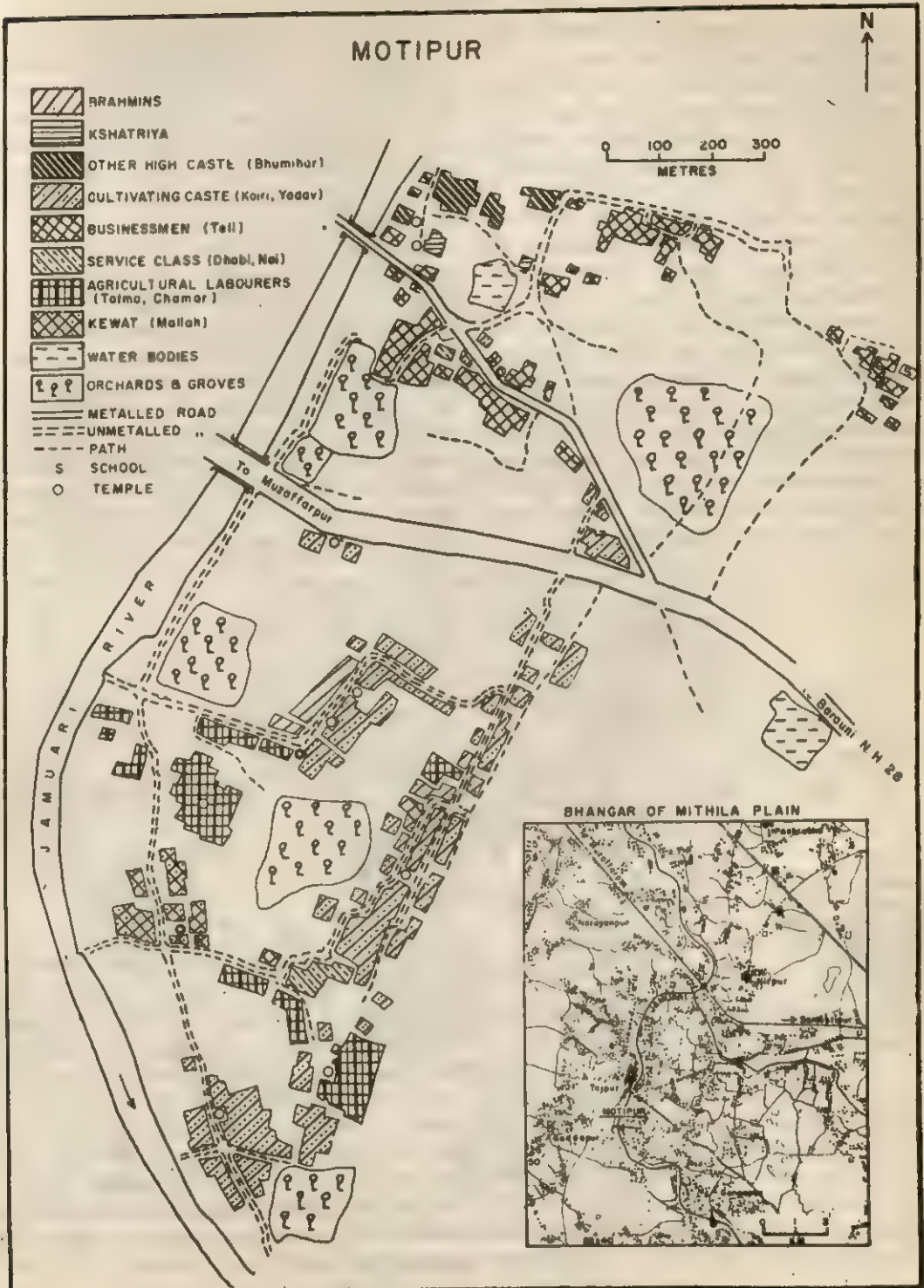


Fig. 5.21 Morphology.

wide ditch) and is dominated by *Bhumibars*, the regional dominant caste. Other castes are on separate sites, the businessmen clinging along the main street. Village Motipur with the surrounding block has a highly scattered irregular pattern tending towards lineation along local tracks and old levees (Fig. 5.21). The main site of Motipur itself is elongated slightly away from the Jamuāri river, while the remaining part is to the north of the road. Tumoul represents the Mithila Plain East, lying in a tract of large compact settlements 3-4 km apart, interspersed with depressions and marshes (Fig. 5.22). There are also a large number of artificial tanks close to or even inside the settlements. The village has a more or less rectangular layout with open space in the centre occupied by groves and water bodies. It is a Kshatriya-Brabmin dominated village with marginal location of agricultural labour castes (Dhanuk, Chamar and musbar).

Village Tarny (Chapra Block) in Saran Plain represents an area of compact and semi-compact settlements with sitings along levees or relatively higher grounds followed by transport arteries, which are intercepted by wide gaps of agricultural and other lands (Fig. 5.23). It is a village with domination of Kshatriyas with some serving castes (*Kabar, Kamm and Kewats*).

The South Bihar Plain has more compact settlements than the wet and relatively more riverine North Bihar Plain and also the western than the eastern in the same region; consequently, the intervillage distance is greater in the south than in the north and also in the west than in the east. Piyania (Udwananagar *Anchal*, Bhojpur Plain) located in the highly fertile and canal irrigated rice area in the Son Canal zone is also a sizeable multi-caste compact village among others (situated 2-3 km apart from each other) and is dominated by the Kshatriyas covering



Fig. 5.22 : Morphology

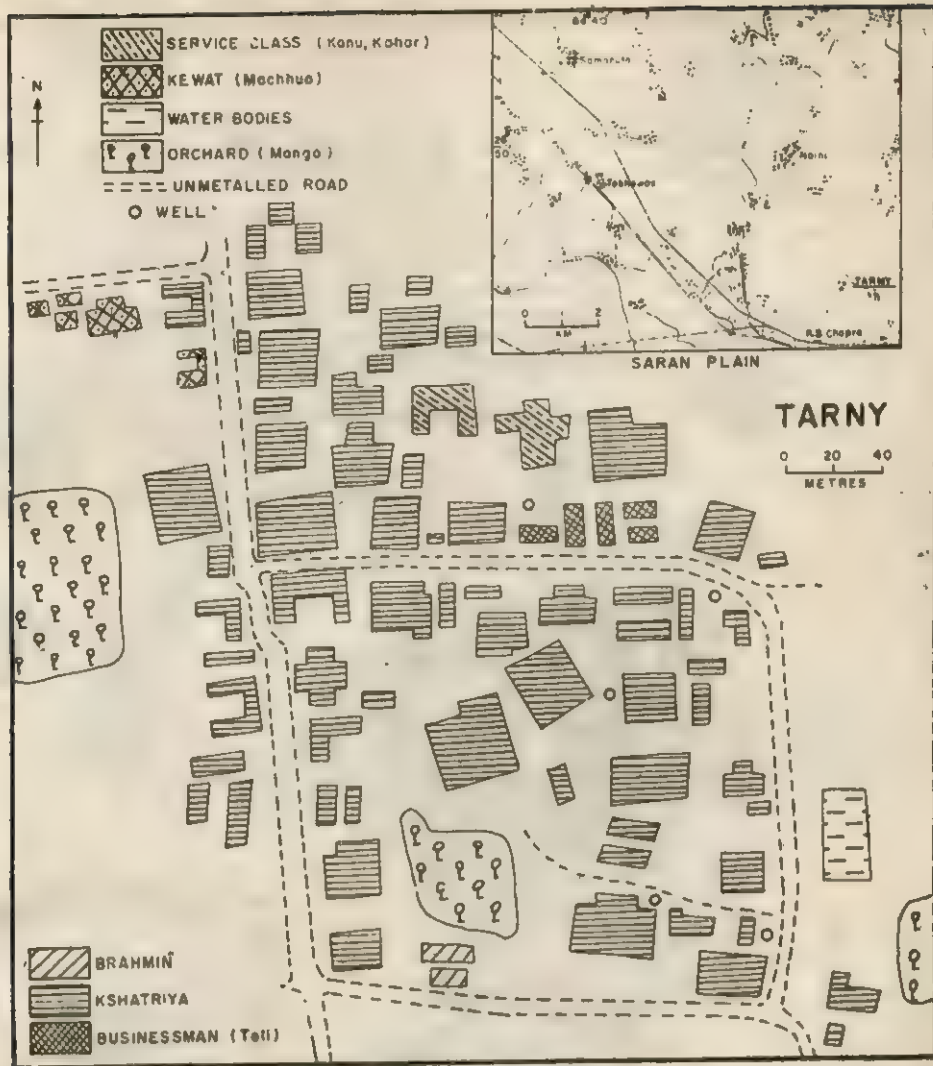


Fig. 5.23 : Morphology

about 70% of the compact settled part, while Brahmins, other cultivating castes (*Yadavas* and *Koiris*) and business community are sited on the fringes (Fig. 5.24). Other serving and labour castes are flung in nearby but separate hamlets. The pattern around Punsia village (Rajauri Block) in Bhagalpur district is slightly different and is characterized by semi-compact settlements with some sprinkling of hamlets dominated mostly by the various cultivating castes. Punsia

Bazar has developed along the Bhagalpur-Deoghar road nearby, inhabited mostly by business community (Fig. 5.25).

The village Deodha and the surrounding country side in the northern part of Magadh Plain (Patna district) display compact and semi-compact patterning away from the riverine tracts (Fig. 5.26). The village itself is situated west of the Navada-Bihar road. The village is a multi-caste settlement with significant clustering of cultiva-

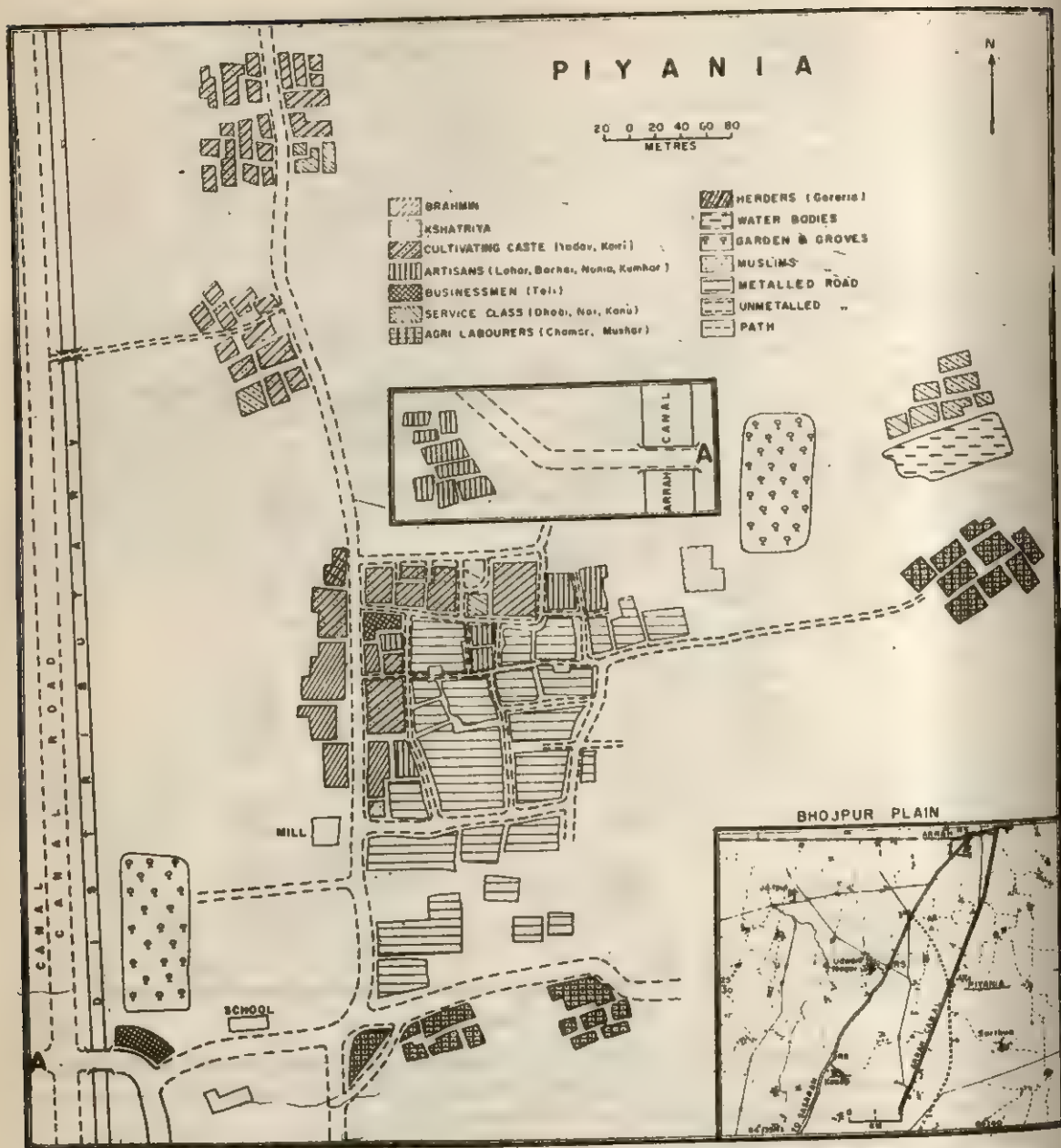


Fig. 5.24 : Morphology.

ting castes though other communities are diffused over the area. The Brahmins are occupying the central part of the village, while the Kshatriyas have a marginal location in the west.

Thus, in the actual distribution of rural settlements, two characteristic types with several intermediate stages are distinguished : Agglomerated or nucleated settlements and dispersed or

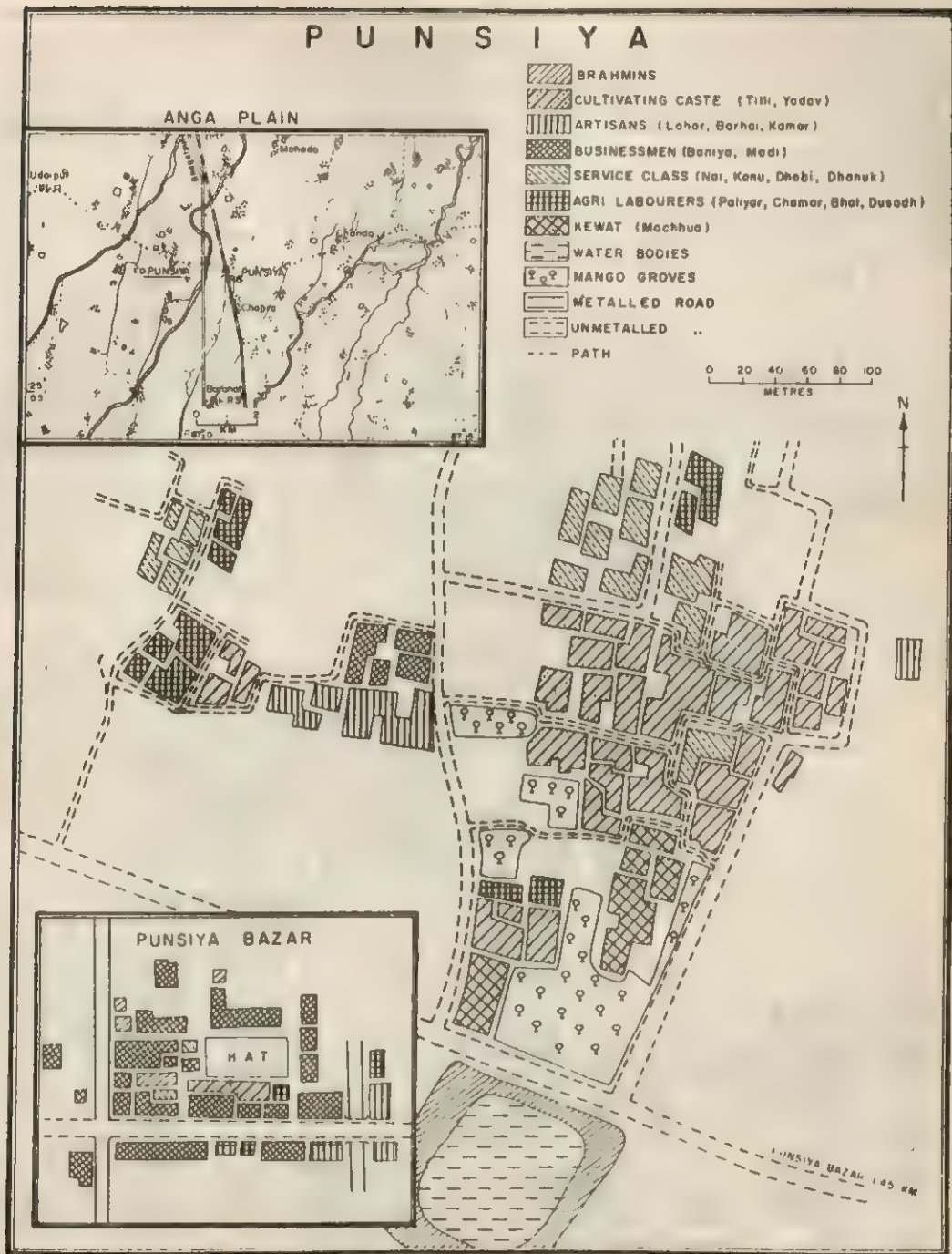


Fig. 5.25 : Morphology.

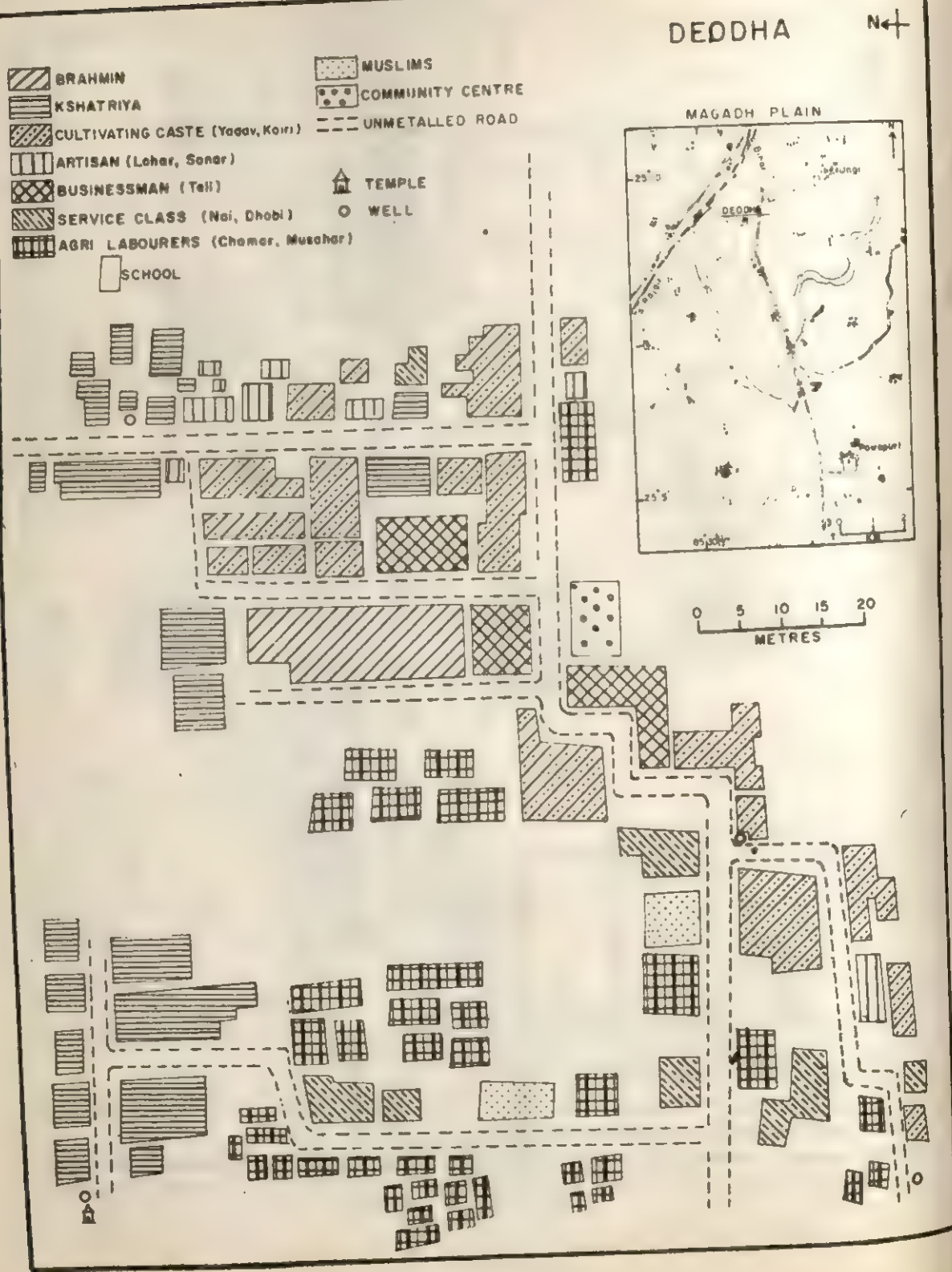


Fig. 5.26 : Morphology.

scattered settlements. Four types are easily discernible : (i) compact type, (ii) semi-compact or hamleted cluster, featured by one main cluster and some hamlets, (iii) semi-sprinkled or fragmented or hamleted type, i.e., several hamlets spread over the entire Mauza and (iv) sprinkled or dispersed type, i.e., diffused distribution of hamlets. In general morphological setting of the village, various centres, communities and social groups are arranged in consonance with the traditional social values and economic organization. Various communities show distinct clustering. In the overall settlement pattern of a locality also, however, settlements are found with differential patternings of dominance and sub-dominance (Fig. 5.15)—they may be referred to as Rajput or Brahmin or Kurmi villages etc., so designated after the dominant group of the village. The *Jajmani* system with traditional arrangement and exchange of social and professional services and obligations is responsible for the inter-village or intra-village spatial patternings.

Urban Settlement

Although the region is one of the least urbanized parts of the country, it contains the oldest living city of the country, and perhaps of the world, i.e., Varanasi, which epitomizes the history of the human settlements in the Middle Ganga Valley and also some of the very ancient towns like Ayodhya, Ballia, Gadhipur (Ghazipur), Vindhyachal, Chunar, Kushbhawanpur (Sultanpur) in East U. P. Plain and Pataliputra (Patna), Gaya, Champa (Bhagalpur), etc. in Bihar Plains. Many of the towns have historical-political and cultural origins on the river banks or the ancient highways, imbibing the cultural history of the ages. The Ganga valley and, in fact, its own banks and confluences with other rivers have given rise to many of these ancient towns as the Ganga has been through the ages as sacred and sanctimonious river as a highway for commerce, politics, and as good for defence and accessibility. In fact, the Ganga, the Ghaghara, the Rapti, the Gomati, the Gandak, the Burhi Gandak and the Son have all functioned, more or less, in these diverse roles and have acted as centripetal forces for the

establishment of settlements, as noted in the foregoing, and more so for urban centres (Fig. 5.14). With their rich and populous agricultural valleys they nourished and maintained their towns for the millennia of years. During the medieval period, although many ancient ones decayed mostly owing to political vicissitudes (like Vaishali, Mithila, Rajgir etc.) or loss of economic hinges, many new ones were added, not infrequently beside the ancient towns causing their decay and sometimes over their ruins. Sultanpur beside Kushbhawanpur, Mirzapur beside Vindhyachal are cases in point. Quite a number of towns during this period grew as trade centres or headquarters of the Delhi Sultanate dynasties or other ruling bodies as also some were developed in memory of royal visits while many grew as citadel of local chief or *Jagirdars*. Both in the ancient and medieval and even early part of the modern period, rivers, mostly unbridged as they were, gave rise to towns on both of their banks because of the break of the overload traffic on either side. During the modern period, however, there has been a face-volte change in urbanizing factors, and economic and servicing factors have asserted more, as such, not only new towns have multiplied but also modification and revival of earlier ones have taken place. Towns have grown up on the cross-road, bridged river sites, railway junctions; and other river towns, unless approached through roads and/or railways began to decline. However, the recently increased tempo of economic activity and town and country development have been effective in urban development.

Contact-point locations of diverse physical terrain with different economic attributes and products, like other break-of-bulk points, have also provided significant sites for urban development. Along the northern Tarai and Plain zone or the southern Peninsular Upland and Ganga Plain contact zone have developed a series of towns : Chunar, Bhabhua, Sasaram, Dehri, Sherghati, Aurangabad, Rajauli, Gaya, Hisua, Navada, Jamui, Jhajha, Kharagpur and Banka are cases in point.

Morphology of the urban centres of the region is governed by a complexity of such physical and

cultural factors as the rivers, river-confluences, bluffs, meander loops, physiographic contact or break-of-bulk points, forts, temples, junction of railways, etc., which have all individually or in combination with others, provided skeletal shape to the towns over which the later functional amalgam has been superimposed. In the alluvial plains, for instance, the nature, size and orientation of the river bluffs have provided the original skeleton to the towns. Later appendage of other routeways, for example, the parallel or transversely running railroad or road has modified the original shape and physical and even functional growth patterns of the town. The lately developed administrative, industrial and institutional functions, such as the addition of the anglicized quarters, cantonments and civil lines, railroad colonies, industrial estates, educational centres, hospitals, etc. with discrete nuclei or routeway-siting, have further modified the

aspect, morphology and functional character of towns.

Varanasi (489,864)¹¹, the epitome of the age-long culture of India, and as such the most sacred city, is the largest city in the Middle Ganga Plain situated on the left bank of the high levee of the Ganga crescent, planned out of not a very good site for expansion on the back; the three cultural nuclei of *Kedareswar* (S) *Visheshwar* (Centre) and *Onkareshwar* (N) are separated from each other by the *Godavari* and the *Mandakini*, the two venerable rivers, one representing the Ganga of the South and the other of the North (Himalaya) (Fig. 5.27). Thus the city exerted a potent force for national integration through the imperceptible processes of cultural assimilation. The confluence of the Saryu of Varanasi with the Ganga provided the burning ghat, hallowed by the memory of *Harishchandra*, the king of ancient *Awadh* and as such, the block to the south

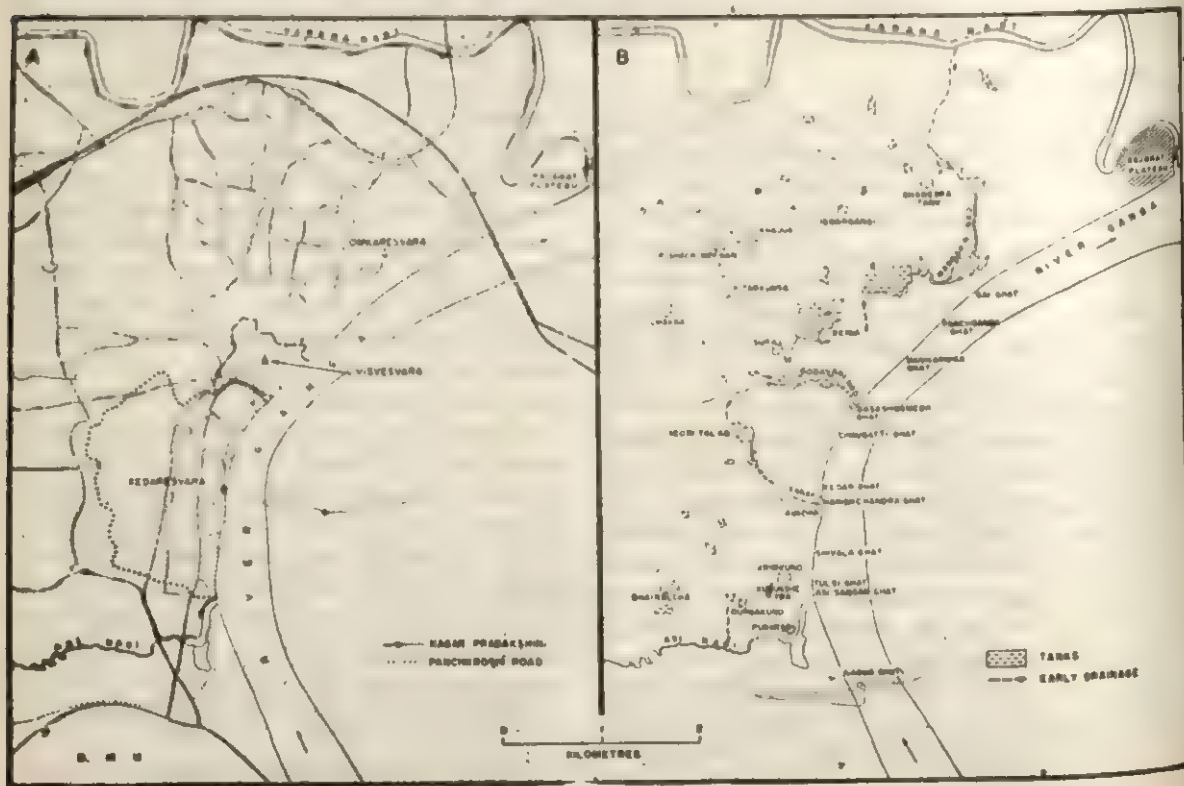


Fig. 5.27 : Varanasi Nuclei.

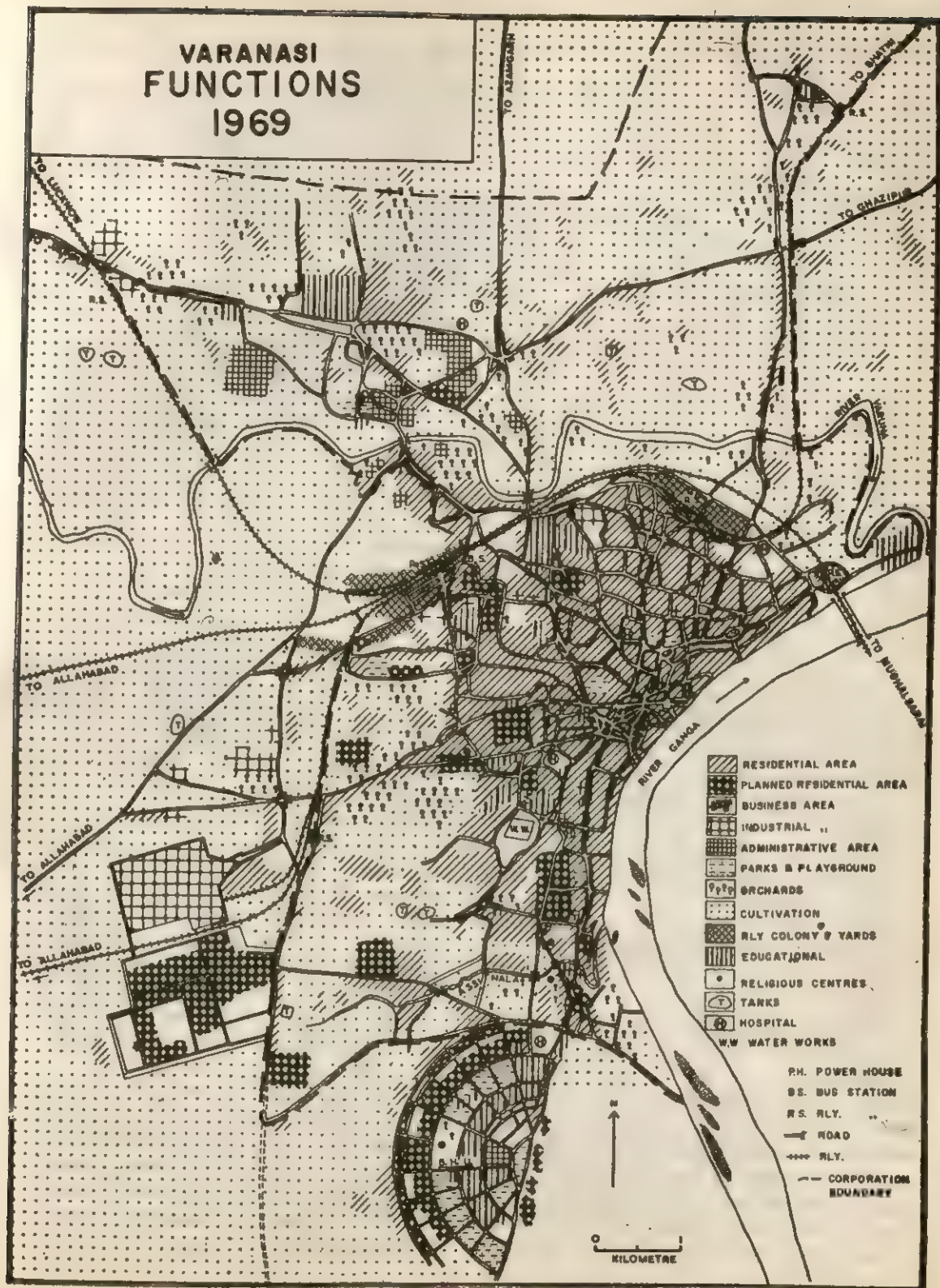


Fig. 5.28

came to be known as the Awadh. This again means the integration of the Awadh culture of the North with the other cultural currents embedded in Varanasi. These discrete blocks coalesced with each other being joined by the Kedatreshwar-Visheshwar lane, the life line of ancient Varanasi, running parallel to the crescentic Ganga through the crest of the levee over a wooden bridge on the Godavari in the present Dasaswamedh area (preserved in the name of a *Moballa* 'Dedasi Ka Pul', bridge of Dedasi). The main residential area has developed roughly like a bow, the Ganga forming its string. New residential areas have grown up along the outer roads, like the Durga Kund-Vidyapith road and the Jagatganj—Civil Court road. There are a number of planned colonies now, and many emerging up in the city which is fast expanding (Fig. 5.28). Having the first bridge (1882) on the Ganga in the whole of the Middle Ganga Valley, the city had the maximum advantage of growth, and has almost trebled its population since then (1881 : 218,573). It is the world-famous centre for silk fabrics and brass works among many other handicraft products, and true to its cultural history, it is the most famous educational centre with three universities. Recently, under planned development programme, the surrounding area has been demarcated as the Regulated Area, and owing to the over-bridge road at Rajghat it is now developing a rather metropolitan character. This character is being accentuated further by the construction of two bridges on the Gomati in the north through which the State and national highways pass linking the city directly to Gorakhpur through the Dohrighat road bridge on the Ghaghara.

Patna (364,594), another very ancient city on the right bank levee of the Ganga backed by a curvilinear depression is the capital city of Bihar and also the second largest in the Middle Ganga Plain.⁴² It was in ancient times the capital of the national Magadhan powers of several dynasties, and has intermittently also shone, thanks to its advantageous geographical setting and location, is one of the glorious cities of India as a trade and cultural centre through its 3,000-year old history

with remarkable attributes of resilience and survival. It has retained its functional character though only a State capital now, as about 45% of the workers are engaged in administrative and professional services. It is a typical linear city, about 20 km long east-west with less than two km width. The main street runs on the back of the levee, with many important institutions in between the river and the road. The oldest eastern part of the city is residential with wholesale grain and spice trade and cottage industries and a few mills. To its west lies the shopping-cum-institutional core with its educational institutions, including the University, Hospital etc., and some of the good residential areas. From the Gandhi Maidan westwards, lie the Civil Lines, the High Court, the Secretariat and planned bungalow-type residences (Fig. 5.29). New residential colonies, though somewhat haphazardly growing, are emerging towards the south and the west in the lowlying land.

Bhagalpur (143,850), the ancient Champa, traditionally the capital city of Anga, and now the headquarters of the Bhagalpur Division, is an important trade and handicraft centre of S. Bihar Plain stretching for about 10 km along the right hand levee of the Jamunia, the southern channel of the Ganga at present. The main built-up area, containing the business and shopping zone, lies between the river and the parallel running railway. To its east lies the civil lines, around the large Sandy's compound and to the west is the educational zone including the university, both being later developments. Residential colonies and farming are mixed all in the east, west and south. Further west is Nathnagar, the India—famous centre of silk-weaving and silk dyeing industry. With Bhagalpur is associated also the Sabour Agriculture College and Farms, about 12 km to the east (Fig. 5.30).

Muzaffarpur (109,048) on the right (south) bank of the Burhi Gandak is the administrative headquarters of Tirhut Division and the largest city of N. Bihar Plain, with a strong commercial base in agricultural produce and textiles, etc. The city is subject to physical disabilities—the earthquake and the flood, and as such, the town-

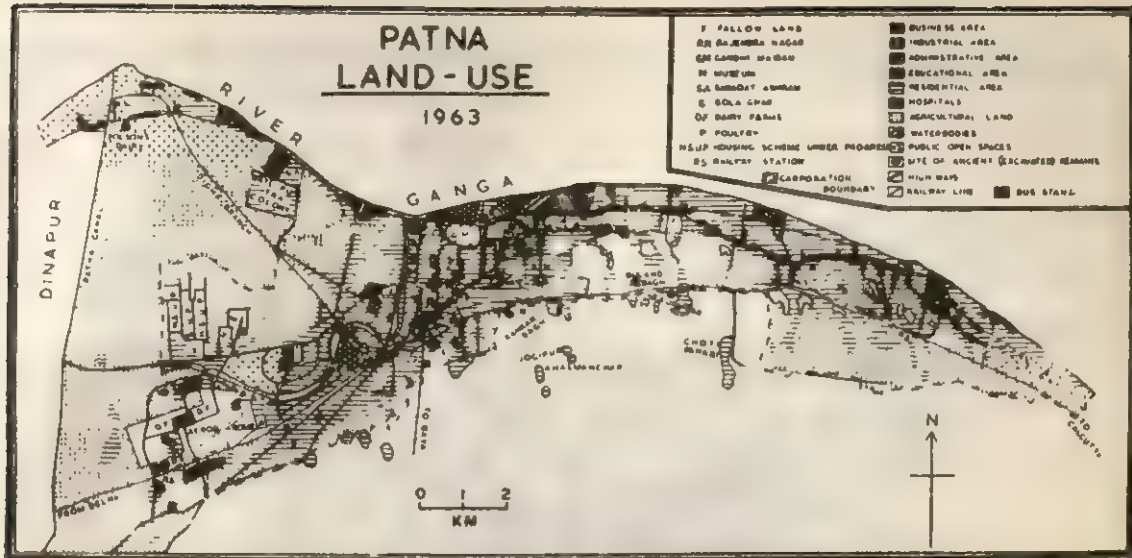


Fig. 5.29

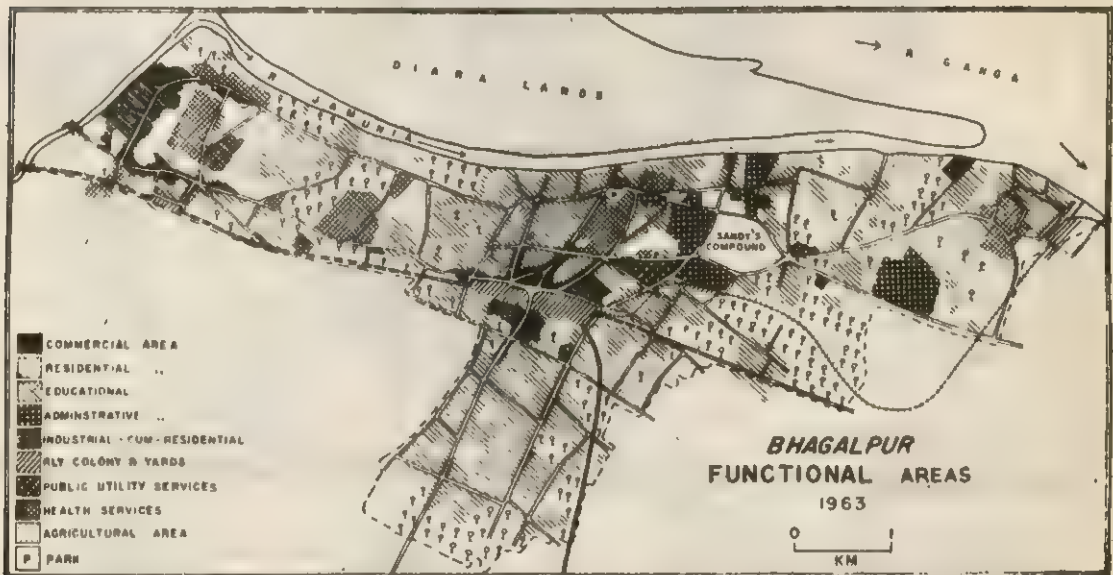


Fig. 5.30

spread has assumed an irregular pattern. The main business area clings to the central road, running south of the old bank; the shift of the river to the north has been accompanied by a

northward projection of the town. Since the last earthquake (1934) the urban expansion has taken place mostly towards the south. The *litchi* orchards are on the outskirts (Fig. 5.31).

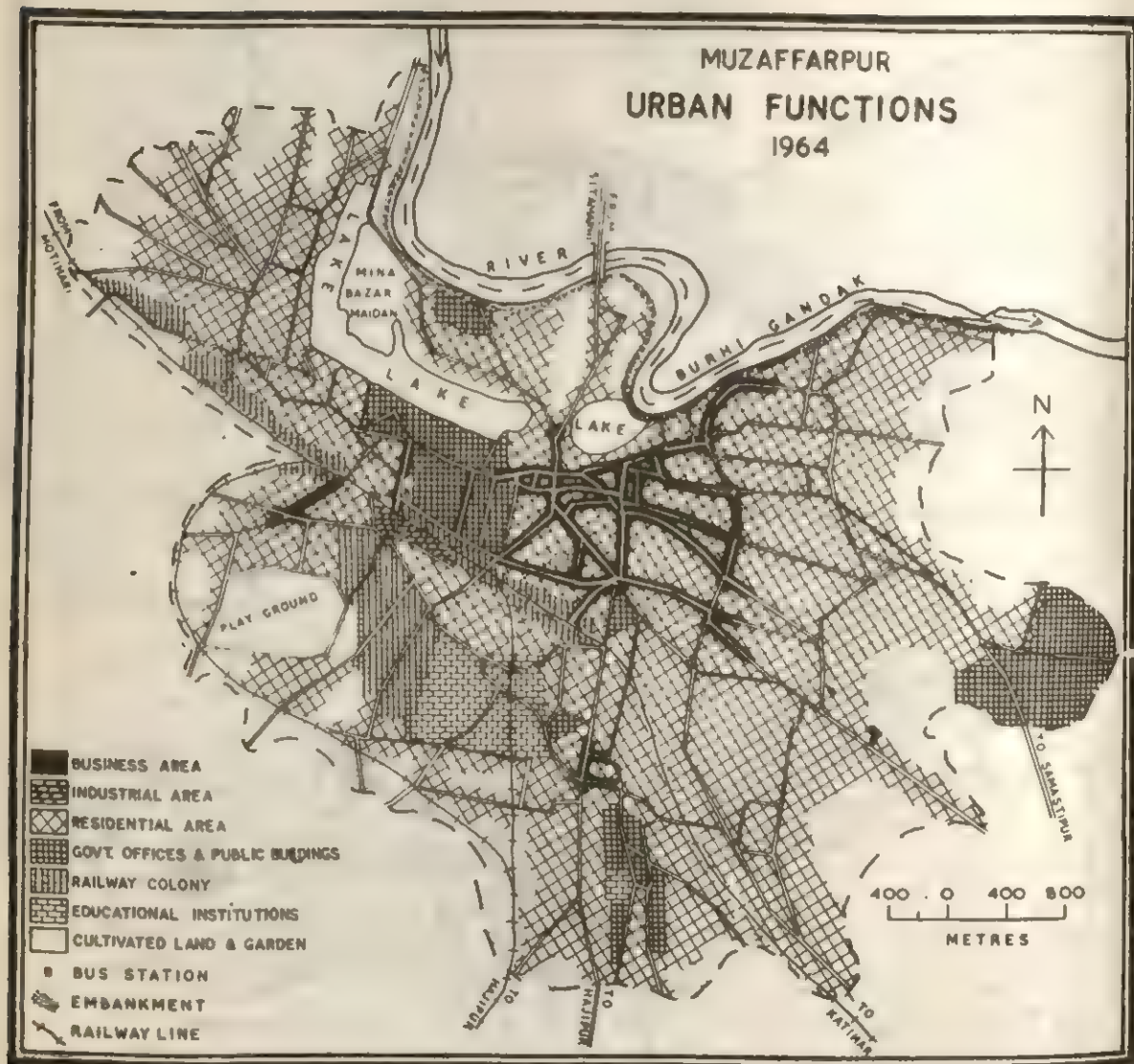


Fig. 5.31

Gorakhpur (180,255)⁴⁸, the regional capital of the Saryupar, is situated on the Rapti, whose constant shiftings have shaped the morphology of the city in different stages. The Gorakhnath Temple, the nucleus of the ancient site, must have been near the bank of the river which then traversed through its present northern part. The city has three distinct functional sections : Basantpur Fort area epitomising the regional domination of the Rajput chiefship; the Urdu

Bazar, a legacy of the medieval period; and the railway colony, the parade ground and the civil lines representing British period, and the University now developing in the parade ground area south of the railway colony (Fig. 5.16).

Motihari (34,602), the district headquarters of Champaran, is located on lakes, remnants of the old bed of the Burhi Gandak, and to its south flows the Dhanauti river, a spill channel (Fig.

5.32). It is a service-cum-commercial town : west of the larger lake lies the railway station and the colony, Government and public buildings, educational institutions and play-grounds while to its east are the principal business section and residential area. The outskirts, as usual, are under horticulture.

Other centres like Deoria, Pratapgarh, Rasra, Maunath Bhanjan, Shahganj, etc., have developed as centres along the junction of the overland routes of local distributive and collective trade and acquired stature as the roadways or railways focussed on them. Most of these centres have also rectangular or other deviant forms or linear shapes and have one main bazar, universally

known as *Chauk* while along the main streets or roads from the Chauk to the railway station or any other transport focus have developed the establishments dealing in various goods and services. Most of these smaller centres also have multi-nuclear growth as different institutions, such as the administrative or semi-administrative offices, educational centres, railway colonies, or some industrial establishments, etc., choose distinct nuclei which have not coalesced together and have wide open interstitial spaces. Functionally, thus, these centres are commercial-educational and administrative, commerce being the most ubiquitous function. Many small towns are also ribbon-shaped, strung along the regional

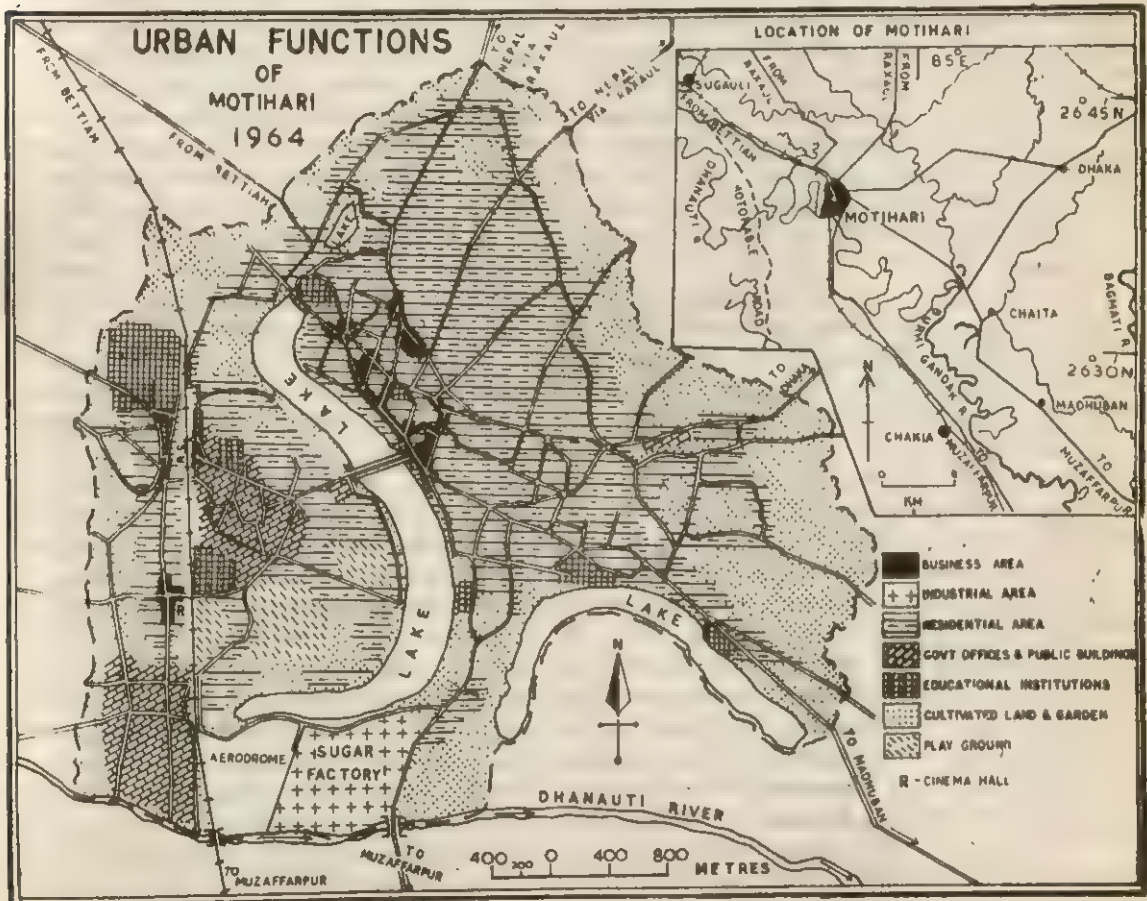


Fig. 5.32

highways. Mughalsarai has developed in the region purely as a railway town situated on the G. T. Road east of Varanasi and the dominance of the road is clear in its ribbon growth form. As majority of the smaller or medium size towns have village origins, they still retain much of rural landscape and activities.

In most of the towns there are, thus, two or more sections—the one, the old town and the other, the newly grown areas. The older parts contain the bazar in most cases, while new shops or market areas, civil lines, and cantonment in some cases, railway colony, and professional or service institutions have developed in newer sections. The older sections are more congested and have narrow winding lanes with mixed types of buildings and generally lack open spaces and parks. The new sections are open and separated by rivers or railway and roads from the older section. In some towns well planned sections, particularly those which have developed after Independence, contain administrative, railway and irrigation colonies, educational institutions, modern industrial sections and other service establishments like banks, hospitals, hotels, etc.

Economy

The economy of the Middle Ganga Plain is highly underdeveloped and also unbalanced as it is overwhelmingly dominated by agriculture and that too, of generally a subsistence type. Other sectors of the economy are yet to come up in the soil of the region.

Agriculture : There is a notable intra-regional variation in the distribution of agricultural land. It varies from 64 to 67% of the total area in the western part of the South Bihar Plain to over 70% in its eastern counterpart, and more than 80% in the North Bihar Plain except in Purnea (77%). In the Eastern U.P. Plain also more than three-fourths of the total land is agricultural in most of the districts except in the *usar*-infested western part of the Doab (below 70%) and Gonda and Varanasi districts with some forest area. The percentage increases from south to north and west to east.

In the Western South Bihar Plain the net sown area ranges from 87% to 92% against the total agricultural share of 62% to 66%, while it ranges

between 69% (Purnea) to 88% (Muzaffarpur) in North Bihar Plain and 77% to 81% in Eastern South Bihar Plain against their lower shares of agricultural to total land. Fallow land percentages are the highest in North Bihar and East South Bihar Plain, being the highest in Purnea (over 29%) while it is below 7% in Western South Bihar Plain. The same trend is found in the distribution of culturable land which is lowest in Western South Bihar Plain but goes as high as 8.25% (Monghyr) in East South Bihar Plain and over 11% (Saharsa) in part of North Bihar. However, it is low in Purnea (2.26%) and Muzaffarpur (2.92%).

Of the total agricultural land, the net area sown percentage is generally higher in East U. P. Plain than in Bihar Plain; the range being between 84 and 94%, both in the Saryupar Plain (Gonda 88.0% and Deoria 94.1%) and the Ganga-Ghaghara Doab (Pratapgarh 84.1% and Ballia 92.0%). The net sown area percentage increases from west to east, coinciding with rainfall incidence, and in consonance with the same there is a north to south decreasing trend. Culturable waste percentages are correspondingly low, the overall range being 2.1 (Deoria) to 7.3 (Sultanpur); it is also lower in east Sarayupar (less than 3) than the western counterpart (5.5%) as well as in most of the Doab (being over 6%) except in Ballia (3.2) and Varanasi (4.12). The current fallow also has a similar trend. The cropping pattern is typical of an underdeveloped agricultural economy with most of the cultivated area (about 90%) devoted to subsistence food-crops, while the cash crops or industrial raw materials like sugarcane (4.8%) or oilseeds (1.4%) have negligible coverage. With the increasing use of the HYV seeds and modern techniques of production and growing facilities for irrigation, storage, marketing and transportation, some traditionally subsistence crops such as rice, wheat or maize have become 'money' crops at least for the well-to-do farmers, and are competing with sugarcane, jute, etc. Jute has been recently introduced in parts of the humid zone, particularly in the Tarai and Purnea district.

Rice is the dominant crop in the East U. P. Plain claiming over 32% of the cultivated area and is followed poorly by gram (15.97%), wheat (11.51),

barley (8.03) and maize (5.85), while about 1/6th of the cropped area is given to various pulses, other than gram, like *Arhar*, *Mung*, *Masur*, etc., and over 4% to vegetables, zaid crop, etc. Rice has a heavy concentration in the north and east and tends to decrease, in correspondence with the lower rainfall, towards west and south west. In humid Saryupar with only less than 1% of rice land irrigated and in irrigated Varanasi district there is the greatest concentration of rice, accounting for more than 2/5 of the net sown area and ranging up to 52% in Basti (Naugarh tahsil with 57%). At the other end, Jaunpur tahsil devotes only 10% of the cropped land to rice, and most of the other tahsils in the western part of the *doab*, between 15 to 30%. In Bihar Plains, rice claims about 9 million acres or 45% of the total cropped area; it is about six times the wheat acreage (1.52 million acres), the next important single crop. Gaya (0.6 m acres), Shahabad (0.56), Purnea (0.55), Darbhanga (0.5) and Champaran (0.49) are the most important districts in acreage. The Burhi Gandak-Kosi interfluvium and Western S. Bihar Plain have the greatest concentration.

Wheat, the most important rabi crop, is concentrated in the rich, moisture-retentive loam silts of N. Bihar Plain west of the Baghmati in S. Darbhanga and contiguous N. Monghyr (east of which it is a mere sprinkle because of excessive moisture), and the irrigated Gaya and Shahabad districts in the Western S. Bihar Plain.

Maize is the third major crop concentrated in the well-drained, fertile sandy loam tracts, south and west of the Burhi Gandak (Saran, S. Champaran, Muzaffarpur, Darbhanga) and parts of Saharsa, Purnea and Monghyr. Barley, next to wheat among *rabi* crops, covers NW Saran, Champaran, and Muzaffarpur in N. Bihar Plain. It is invariably mixed with gram. Pulses are important both as main and cash crops, and together stand second to rice. Gram alone covers 1/5th of all pulses or about 5% of the total cropped area of Bihar Plain. It thrives in adequately aerated and drained sandy and loamy soils of S. Bihar Plain and N. Monghyr and S. Saran. Shahabad, Gaya, Patna and Monghyr together account for 70% of the pulses in Bihar Plain.

Oilseeds are widely grown cash crop, and Purnea, Shahabad, Gaya and Champaran are important for them. Sugarcane thrives in the *bhat* soils of the Southwestern and western parts of N. Bihar Plain, contiguous to the East U. P. sugarcane belt and feeds the local sugar factories. It is next to rice and pulses in all Tirhut districts. It replaced indigo cultivation in the thirties. It is also grown in the irrigated western S. Bihar Plain, especially in Shahabad district.

Jute, although a recent entrant in the crop economy, stands next to rice in Purnea and Saharsa which together produce 80% of Bihar total.

Irrigation plays a significant role in the farming operations and agricultural land use of the region. Seasonal concentration and ill-distribution of rainfall, both in space and time, and other monsoonal vagaries necessitate supplemental irrigation for not only annual crops like sugarcane or zaid crops which are grown in the precarious summer, but also for higher yields of the *kharif* and *rabi* crops. Now that the farmers are picking up modern farming techniques, need of the availability of adequate amount of water to the fields at opportune times cannot be over-emphasized.

Of the net sown area, about 33% in the Bihar Plains and over 37% in East U. P. Plain are irrigated but there is wide sub-regional and local variation in the distribution of the irrigation patterns depending on the irrigational needs, types of terrain, crops raised and availability of water sources. In general, the areas of relatively higher rainfall and lower variability have lesser percentage of irrigated area, which increases from east to west and north to south in the Bihar Plains and also in East U. P. Plain, with some exceptions. In the more rainy N. Bihar Plain less than 7% of the net sown area is irrigated while the less rainy S. Bihar Plain irrigates as much as 60%; also while the Kosi Plain, where the rainfall is the highest and variability the least, only 4.5% of the net sown area is irrigated. In the eastern part of the S. Bihar Plain, where rainfall ranges from 100 to 120 cm and where variability index is 20, about 75% of the net sown area is under irrigation. Also, over one-fourth of the sown area of the Anga

Plain is irrigated. There is a still higher variation in terms of districts : while Purnea in NE Bihar has only 1.04% under irrigation, Gaya in the S. W. irrigates about 78.28% of its net cultivated land.

In the East U. P. Plain, the highest percentage of irrigated area is found in the Ganga-Ghaghara doab, a zone of 95 to 110 cm of rainfall and 20 to 28% variability; while the lower doab districts (Ballia 34.7, Ghazipur 37.4) have below the average irrigation percentage, the central doab districts have about half of their sown area irrigated—Azamgarh (50.4%) and Jaunpur (51.7%). Varanasi, partaking area both in the doab and Gangapat Plain also irrigates about half (48.1) of its cultivated land. In the Saryupar Plain also the intensity of irrigation increases east to west (Deoria 35.5%, Gorakhpur 37.6% & Basti 43.7%) but it drops further west (Gonda 26%).

In the South Bihar Plain, canals are the most important single source of irrigation in Shahabad, while elsewhere 'other' unspecified sources are important. In the Lower Son valley, the Son canal system irrigates about 1.1 million acres (65, 23 and 12% respectively in Shahabad, Patna and Gaya districts). About one lakh acres are irrigated by the Sakri Canals in Monghyr; elsewhere canals are less important. Water is also derived from rain-dependant *Pynes* which are privately or village-owned canals, *Ahars* (elongated depressions, locally known as *Tal*), tanks and ponds, which all are rendered ineffective when rains fail. These sources are important in Shahabad, Monghyr and some other parts of the S. Bihar Plain. Wells (including tubewells) also hold significant position in Shahabad, Patna and Gaya. However, it is the 'other' sources of irrigation which are dominant, overwhelmingly in Gaya (65% of the total irrigated acreage) and over 40% in Bhagalpur, Santhal Parganas, Monghyr and Patna; this highlights the precarious character of the existing irrigation facilities.

In the N. Bihar Plain, canals are important only in Champaran district where about 70% of the total cultivated area is irrigated (mainly of rice land) by the Tribeni (from the Gandak) and the Dhaka (from the Lal Bakhya) canals. To its south in

Saran, wells and tubewells account for 75% of the irrigated area; canals are negligible, and the *Ahars* and 'other' sources share about 20%. In Kosi Plain more than 95% of Saharsa and 70% of Purnea get water from 'other' sources. *Ahars* in Darbhanga (80%) and canals and 'other' sources (together 75%) are important in Muzaffarpur.

In the East U. P. Plain, unlike most of the Bihar Plain, wells and tubewells are the most significant sources of irrigation, and nowhere except in Basti (44.7) and Gorakhpur (48.4) in the Saryupar, do they irrigate less than 65% of the total irrigated area. In the Ganga-Ghaghara Doab it ranges between over 68% (Pratapgarh) and 87.5% (Jaunpur) except in Varanasi where canals from the Karamnasa and its tributary, the Chandra-prabha, are important (35.4%), but all are in the Gangapat tract in Chandauli and Chakia tahsils. The preponderance of wells is mainly because of suitable terrain, availability of potable water through both the surface and tubewells, and handy nature of surface wells involving less cost. Canals are also gaining ground next to wells in Pratapgarh (23.6%), Ballia (12.9), Ghazipur (10.2) and Jaunpur (6.3). The Sarda canal extensions and Pump Canals from the Ghaghara at Tanda and Dohrighat are the chief sources. 'Other' sources are important in Basti (37.0%), while reservoirs, lakes, ponds and tanks also hold importance, irrigating 1/6 to over 1/3 of the total irrigated area in Faizabad (26.5%), Gorakhpur (26.2), Gonda (26.0), Sultanpur (20.4) and Basti (16.8). Although there is good amount of water in the Sarayupar, canals are not feasible as they are liable to cause water-logging due to absence of adequate slope and defective drainage lines to cross.

The power-driven tubewells bid good promise in the region as they can be sited in compact, well drained blocks of 200-300 hectares or so. They can serve the area most without interfering with irrigation from tanks, *jbils* and surface wells in the lowlying areas. However, so far, there has been no scientific ground water survey, and there is a feverish activity in tapping ground water through diesel or electric pumps from different levels, often causing drying-up of the country wells leading sometimes to scarcity of even drinking

water in the rural areas. In this region the impounding of rainwater in surface reservoirs or *Ahars* by throwing embankments across the small rivulets will go a long way in assuring irrigation by ponds and wells, at the same time maintaining the water-table level of the village wells.

Intensity Index of Cropping (1960-61), a result of double or multiple cropping, is higher in Bihar (138.1) than in U. P. (125.1) as a whole because of higher rainfall in the former. In the western South Bihar Plain it is the highest (Gaya 153, Patna 160 and Shahabad 170), owing to fertile soil assured of widespread irrigation facilities from the Son Canal system, tubewells and other irrigation projects. Purnea (152) is also important. The figures for Tirhut districts are rather low, ranging from 128 (Muzaffarpur) to 138 (Saran), while eastern S. Bihar Plain is still lower (125), and so is Saharsa (118), all forming a compact block of low intensity. In the East U. P. Plain, Faizabad and Gonda (and contiguous Barabanki, though outside the region) comprise a block of higher intensity (140 and above) and the contiguous Sultanpur, Basti and Gorakhpur form a zone of medium index (130-140) with detached

Varanasi district enjoying the same range. The remaining parts show lower index (116 to 130).

An analysis of per capita rural agricultural holding provides the key to the enormity and seriousness of the land problems in the predominant agrarian economy of this region. U. P. (0.74 acres) has a somewhat higher incidence than Bihar (0.47) as a whole but there are wide variations in both. The eastern U. P. Plain districts range (0.51 to 0.74) all below the State average, but have more lands than most districts in Bihar Plain, where, except Shahabad (0.56), Gaya (0.50), and Bhagalpur (0.53), the range is below 0.48 everywhere, dipping down to the lowest (averaging 0.36) in three Tirhut districts (Darbhanga, Muzaffarpur and Saran). Agricultural holding per cultivating household is the highest in S. Bihar Plain (5.25 acres in Patna to 7.15 in Shahabad) and Kosi Plain (6.0 in Saharsa to 7.57 in Purnea) amongst the regions of the Middle Ganga Plain, while it is below 4 acres in Tirhut except Champaran (4.50) and East U. P. Plain districts except Ballia (5.1). Thus the most densely settled districts with wholly plain character have the lowest per capita land.

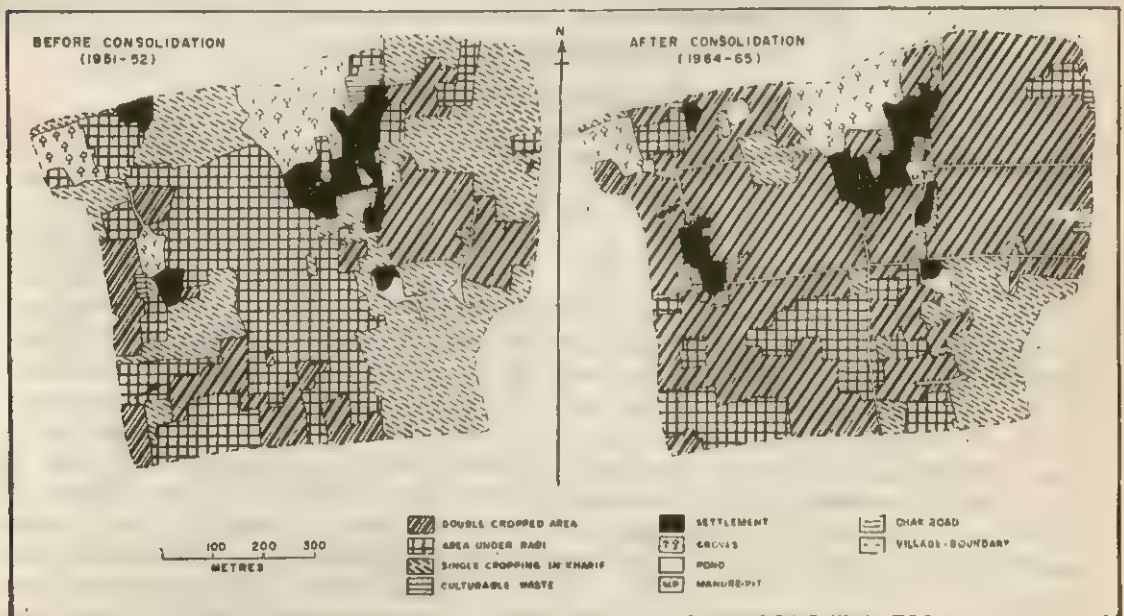


Fig. 5.33 : Village Mainparpur Landuse

Moreover, the cultivated fields of even the small landholdings are widely scattered and sometimes with very small size (less than 0.05 acre) though efforts are being made, particularly in East U. P. Plain, to consolidate the holdings to sizable units, yet their suitability for mechanized farming is questionable. A case study of Mainparpur village (Azamgarh Tahsil) is quite revealing in several ways.

Mainparpur (area : 156 acres, 1961 population : 589 persons; $26^{\circ}3' N.$ and $83^{\circ}3' E.$) is situated in the *Bhanger* tract of the Ganga-Ghaghara Doab East. There are 81 households and 157 agricultural workers in the village. There were 983 plots which have now been consolidated into 278 *chaks* (blocks) out of which over 60% are still below 0.5 acre (Fig. 5.33 and 5.34).

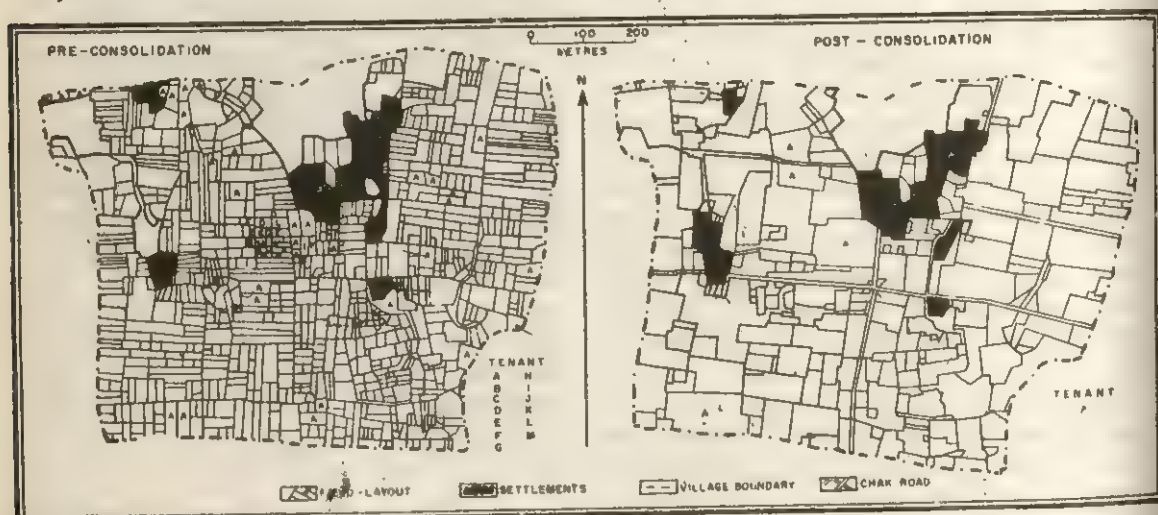


Fig. 5.34 : Village Mainparpur Field pattern

Changes in the Size and Number of Fields

	Below 0.05 acre	0.05 to 0.5 ac	0.5 to 1 acre	1 acre to 1.5 acres.	1.5 acre to 2 acres.	2 to 2.5 acres	2.5 to 3 acres	3 to 3.5 acres	3.5 to 5 acres	5 to 10 acres.
Pre.	55	916	15	5	...	1	...	...	...	1
Post.	7	167	39	24	10	7	3	2	1	1

As a consequence of consolidation, the agricultural land has gone down by 9% as some land has been set apart to be used for common purposes of the village community, such as school, road, *Panchayatghar*, etc. There has been greater intensification of cultivation as the double-cropped area has increased by 150% owing to increased irrigation facilities often at the initiative of the farmers themselves.

Crop Combination : Transitional climatic character of the region between the perhumid Bengal

and the sub-humid Upper Ganga Plain is manifest in its crop combinations—the regional crop economy is not as diversified as in the latter but is more so than the former. There are two important seasonal crop-systems—*Kharif* and *rabi* but not so well defined as in the Upper Ganga plain, and although *bhadai* and *zaid* (summer) seasons do operate here, yet not so strongly as in the perhumid Bengal. The *Bhadai* crops (early rice, maize, inferior millets like *sawan*, *kodo*, *marua*, etc.) and *Agabani* crops such as millets

In the region itself, there are wide combinational differences between the relatively drier East U. P. Plain and the more humid Bihar Plain, while jute takes the lead in some blocks in NE Purnea in the latter, wheat, gram and barley become dominant crops in the western fringes of the former region. Rice is the premier crop of the region except in a contiguous block of northern Monghyr district, parts of Bhagalpur, Samastipur and Madhepura subdivisions in Bihar Plain and wheat in Utraula (Gonda), gram in Phulpur (Allahabad) and barley in Jaunpur and Kerakat (Jaunpur) tahsils in East U. P. Plain.

Rice-maize combination has developed in the mid-western zone of North Bihar Plain south of the Tarai from Siwan (Chapra) in the west to



Saharsa in the east and in detached Balrampur Tarai (Gonda) and Machhalishahar (Jauhpur) in the Western Ganga-Ghaghara Doab. In this region some villages like Raghunathpur Khurd are exceptional, where maize becomes the first ranking crop (Fig. 5.36). Wheat is the third crop in most of the zone except where replaced by jute (Saharsa, Madhepura, Khagaria) and barley (Machhalishahar). Fourth crop is barley in the major portion and wheat in Saharsa and Khagaria.

Rice-gram, rice-wheat and rice-barley combinations have naturally developed exclusively in

the East U. P. Plain. Rice-gram covers three zones : (a) a narrow ribbon covering Pharenda, Khalilabad, Tanda, Akbarpur and Sultanpur and detached Harraiya and Kadipur tahsils in the north and west; (b) Karchhana, Meja, Mirzapur and Chunar tahsils in Gangapar tract in the south, third crop being wheat in both the areas except in Harraiya (maize) and Kadipur (barley), and (c) Salempur and Ghosi tahsils, Ballia and eastern Ghazipur and Chandauli tahsil of Varanasi, with barley as third crop everywhere except Ballia tahsil (maize).

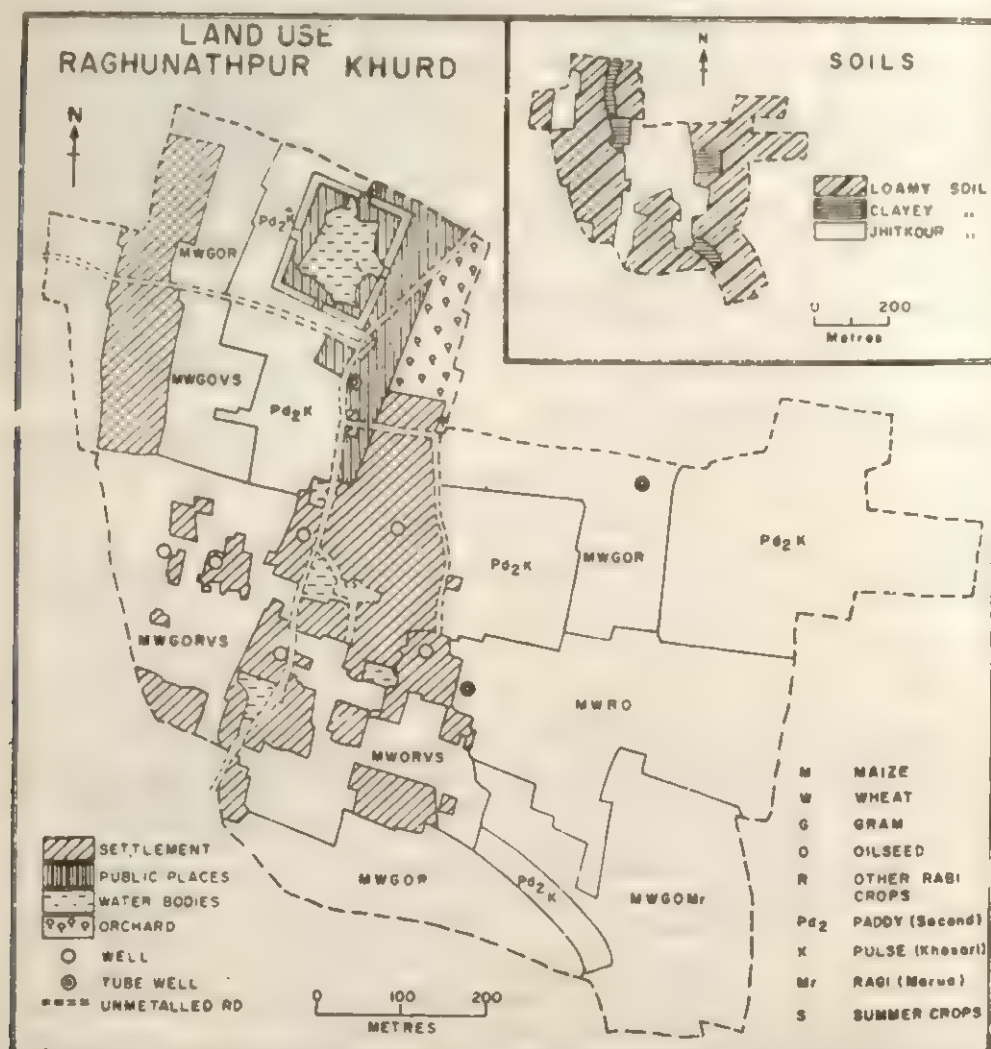


Fig. 5.36

PLATE IV



Bullock cart carrying sugarcane



A view of Varanasi Ghats

A view of rice fields near Varanasi



A view of rice plantation in Banaras Hindu University farm



Rice-wheat combination with gram as third crop is found exclusively in the Saryupar of Eastern U. P. covering Gorakhpur district (except Pharenda) and Deoria tahsil in one zone in the east, and Basti district (except Khalilabad) together with detached Faizabad tahsil in the other in the west.

Rice-barley zone with gram as third crop except in Shahganj and Mariahu (maize) covers Azamgarh district (except Ghosi), Saidpur, Ghazipur, Varanasi, Bhadohi, Handia and Patti tahsils of the Doab. In the Ganga-Ghaghara Doab barley enjoyed second position to rice till recently.

In the Kosi Plain rice-jute combination has developed over most of the area with pulses or maize taking the third and wheat or oilseeds the fourth place. The *Bhat* soil zone in Deoria, Saran and Champaran has developed rice-sugarcane combination with wheat and barley enjoying subsequent ranks. Barley as the first ranking crop holds importance in Jaunpur and Kerakat tahsils followed respectively by maize and gram while rice is rele-

gated to the third position in both. Phulpur (Allahabad) and Utraula (Gonda) which border the Upper Ganga Plain, are the only tahsils with gram and wheat respectively as the first crop followed by barley and rice in the former and rice and maize in the latter.

Industrial Economy : On the industrial map of India, sugar excepted, the Middle Ganga Plain appears to be a void with its few individual prized stars—Sahupuri (chemicals), Maruadih (diesel Locomotive), Gorakhpur (fertilizer) in East U. P. Plain and Dalmianagar (a complex of cement, paper, chemical group, sugar and vegetable oil) in S. Bihar and Barauni (petro-chemicals) in N. Bihar Plain; the rather large railway workshops of Gorakhpur and Jamalpur also add importance to the industrial activity. As such no industrial landscape worth the name has emerged in the region : only the sugar industry in which U. P. and Bihar have the most prominent place in the country has developed the semblance of an agro-industrial belt from the river Baghmati westwards

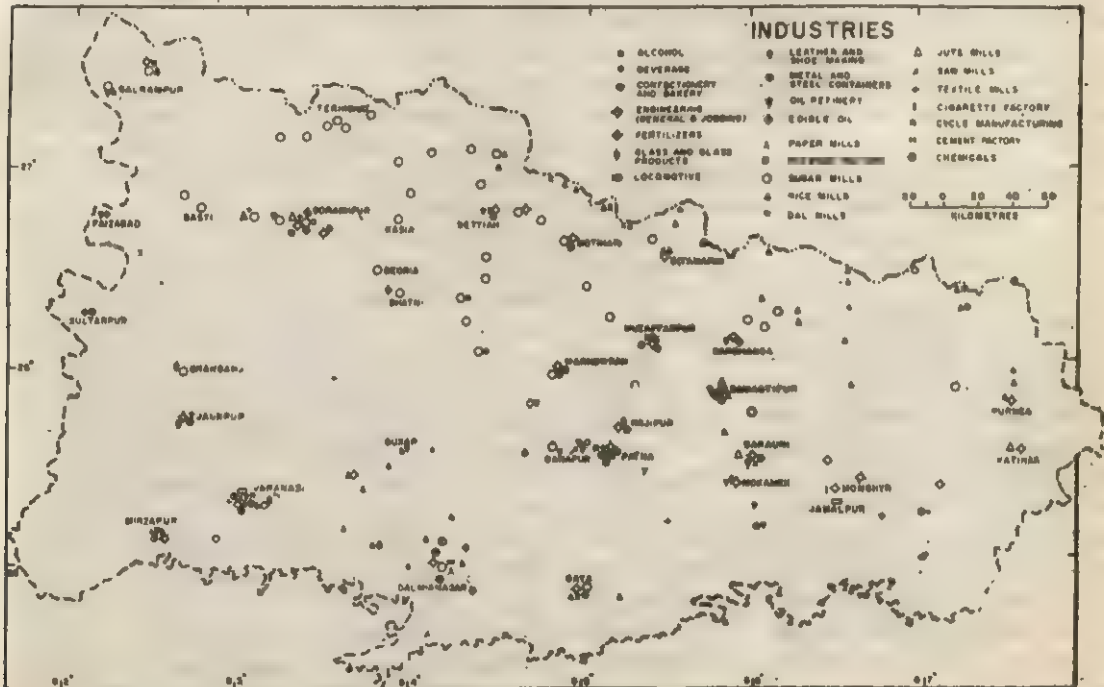


Fig. 5.37

through the western N. Bihar Plain to the Saryupar Plain of Eastern U. P. (Fig. 5.37).

The proportion of non-agricultural workers to the total workers in the primary sector is very revealing and pertinently reflects upon the under-development of the secondary, tertiary and quaternary sectors of the economy : this percentage is below 1.0 everywhere except in Varanasi (2.0). More so, the majority of the industrial workers are engaged in household industries; nowhere does manufacturing over-ride the household industry in terms of employment.

Among the household industries, the textiles and other agro-based industries lead in the region together accounting for more than 50% of total employment in Bhagalpur (60%), Basti (65%), Azamgarh (64%), Faizabad (61), Darbhanga (61), and Varanasi (59), elsewhere ranging between 40 to 50% and low only in Jaunpur and Sultanpur (both 35%) and Saharsa (33%). Textiles predominate the other agro-industries in Basti (50%), Azamgarh (48), Varanasi (47), Faizabad (46) and Darbhanga (49) but less so in Gorakhpur (33%) and Saharsa (18%); in the remaining districts agro-groups are the leading industries except in Champaran, Muzaffarpur and Saharsa, all in N. Bihar Plain where livestock and fishing are important.

Among the factory industries also agro-group and textiles predominate. Agro-group takes the lead in 14 districts employing over 41% of the total factory workers at district level, except in Monghyr (37.02), Saran (35.6) and Gaya (26.6). Deoria (73%) and Basti (50%) districts of the Saryupar Plain are most important in this respect.

The sugar factories numbering 55 (1964) employ 38,000 persons. A large part of the cane grown is converted into *Gur* and *Khandsari*, more particularly in U. P. The maximum concentration of the industry is in the *Bhat* soil zone. Outside the main belt, there are only six sugar mills, located south of the Ganga in Gaya (3) and Shahabad and Patna (each with one) and only one at Shahganj in the Ganga-Ghaghara Doab. Some co-operative sugar factories are also being established as at Dobhi (Jaunpur), Aurai (Varanasi), Ghosi (Azamgarh), etc.

Other agro-group industries comprise rice, flour, *dal*, oil-crushing, fruit and fish-canning and dairy products etc. They are naturally widespread being located in small towns and bazars in general, with significant clustering in larger centres. Rice-milling is more developed in rice areas with few bands, one in the Tarai belt of N. Bihar, and another in the Saryupar Plain in U. P. Flour, oil and *dal* mills are also widespread, with higher significance in western S. Bihar Plain and adjoining Ganga-Ghaghara Doab.

Cotton textile units including power-loom centres are located at Phulwari (near Patna), Buxar, Gaya, Varanasi, Mirzapur, Mau, Akbarpur, Tanda, Khalilabad, Madhubani, Bihar Sharif, Mubarakpur, etc., most of them being traditionally important handloom centres. Mirzapur, Varanasi and Bhadohi are important woollen carpet centres. Jute industry, a new entrant, is located at Katihar and Samastipur, with 7,500 workers each, and Sahjanwa (Gorakhpur) with over 1,000 workers. In silk, Varanasi is world famous for 'Banarsi Silk' with more than a dozen large units, while Bhagalpur is important for *Tassar* silk, where another unit is being set up with Japanese collaboration.

Dalmianagar on the Son at the tip of the Rohtas Plateau in Shahabad district is a heterogeneous mineral, forest and agro-base industrial complex such as cement, asbestos, chemicals, paper and pulp, card board and plywood, sugar, vegetable ghee etc., which have developed since 1933. Barauni has developed a large oil-refinery and associated petro-chemical complex based on Assam crude piped to this place.

The district headquarters and larger cities like Varanasi, Patna, Gorakhpur, Bhagalpur, Gaya, Muzaffarpur, Darbhanga and Mirzapur, some with industrial estates, have an industrial status in their own right having a host of textile, food processing, light engineering and foundry units, chemical, electrical and various other consumer goods units, printing and publishing, etc. Varanasi and Patna are by far the largest centres. Varanasi is developing, apart from its traditional line; some important industrial units such as the large Diesel Locomotive (Maruadih), chemicals

(Sahupuri across the Ganga), glass (Ramnagar), Asia Cycle works, and dozens of various industrial units between Varanasi and Moghalsarai along the G. T. Road.

Transport and Communications

The basic structure of the transportation system of the region consists of a network of roads of diverse nature and capacity, railways operated mostly by the Northern and Eastern (both broad gauge) and North-Eastern (metre gauge) zone, a rather incomplete net of airways, and navigable rivers by country boats of various sizes and ferry steamer services at important points mainly along the Ganga (Fig. 5.38). The Asian highway from Turkey to Bangkok and further to Saigon also passes through the region with important link with Kathmandu : this highway has provided a great fillip and a spurt for road and bridge construction in the region. These transport arteries, particularly the roads and railways, have had profound impact on the nature of the regional economy and social and political structure and have

brought out remarkable changes in the type and volume of traffic as well as in its orientation in recent years. Being itself a densely peopled region with heavy demands and changing export-import trends, and also located midway in the different regions of the Great Plains, east-west as well as the Peninsular parts and Nepal, the regional transport arteries stand always on the nerve for movement of enormous quantities of food and industrial raw materials and goods as well as heavy passenger traffic. Intra-regional transport always suffers from the enormity of the bridge traffic. In view of the enormous task of agricultural and industrial developments, the need for a huge expansion becomes imperative.

Three main railways run through the region—two broad gauges, one running south of the Ganga via Mirzapur and the other north of it up to Varanasi; further, both run to Calcutta with different routes from Moghalsarai, the biggest railway yard of India; the third one is a metre gauge but large net serving the Doab, the Saryupar and

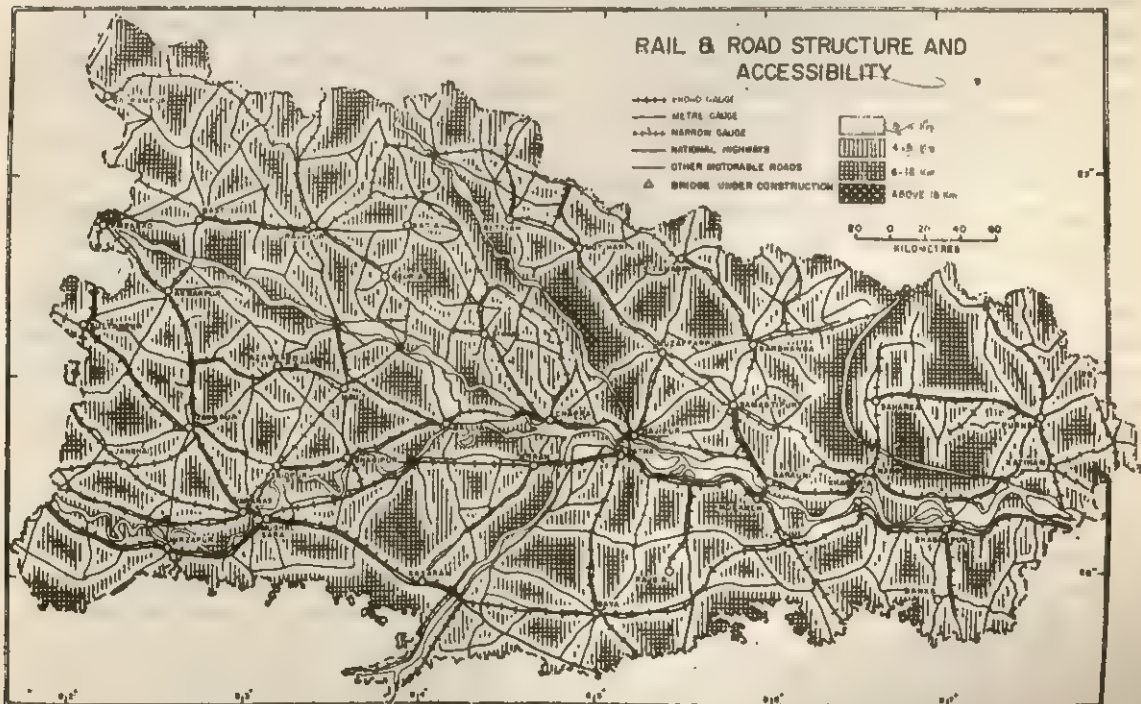


Fig. 5.38

N. Bihar, linking all these areas to Assam. The region has direct linkage to Delhi, Calcutta and Bombay, and via Chunar-Jhopan-Garhwa railway to the vast interior of the immediate Peninsular lands. From the map it is obvious that the general outline of the railway net is almost complete except a few gaps, particularly in the Kosi tract of N. Bihar and the Saryupar Plain. These areas are more riverine, have medium to high drainage texture, and suffer from severe floods and shiftings of the river channels which impede the development of transport arteries particularly the railways. Because of the shift of the Kosi, the railway lines from Forbesganj to Anchra Ghat, Anchra Ghat to Nirmali, and Nirmali to Supaul were dismantled and could not be reconstructed. The Bagha-Chhitauni link joining the Saryupar and the northern part of the N. Bihar Plain could not be re-established since 1924 when the Bagha bridge collapsed during the Grandak floods. In the Saryupar, the Kuwana-Rapti interfluvium in the south is a big gap—the long contemplated Bahalyanj opposite Dohrighat on the Ghaghara, Sahjanwa-Menhawal-Banar-Domarragan-Balrampur railway line, if executed, will traverse through one of the most inaccessible lowland tract of the Saryupar, west of the Rapti. There is also a poor link between N. Bihar and S. Bihar as well as the Ganga-Ghaghara doab and the Saryupar Plain, the recently constructed road-rail bridge at Mokameh on the Ganga and road bridges at Ayodhya and Dohrighat on the Ghaghara may hardly cope with the increasing traffic. The bridge under construction on the Ganga at Patna opposite Hapur and at Buxar will be very significant for regional linkage between the Northern and Southern Plains.

The different rail gauges and single track system on many of them put extra burden on the existing arteries and the break of bulk points created as such hold the traffic to the point of inefficiency. In North Bihar and also in the Saryupar, railways and roads run parallel to one another as well as to the drainage lines because of bridging difficulty and costs, and also interference with the drainage, all resulting in long circuitous and time-consuming routes from one town to another. South Ganga

Plain and the Doab have greater railway and road-way transport facilities. It would seem that the Ganga, though traditionally a great bond, has been also a great divide—one can see high accidentality along both of its banks, the railroads aligning them almost throughout, and in several gaps tract-branch railway lines are also provided. There is, however, need for more such branch railway lines. Road network also suffers from its parallelism to both the rivers and railways as their complementary and local service character are lost to that extent. South of the Ganga and the Ghaghara the road net is broadly satisfactory barring a few gaps but the Saryupar and N. Bihar, mostly the eastern half, are poorly provided. In most of the areas, however, the road net suffers from many difficulties such as inadequate number of bridges and lack of hard surfacing, and is subject to frequent breakdowns during floods.

With the advent of the railways and roads, the importance of the rivers for navigation fell due to various physical and economic factors. Since the closure of Calcutta-Patna (formerly up to Mirzapur and Varanasi) steamer service on the Ganga, the water transport is limited to ferry-steamers service, ferry boats and countryboat services.

Within this vast expanse, the tract on both sides of the Ghaghara covering the corners of Patna, Gorakhpur and Azamgarh districts and part of the northern fringes, particularly in Saharsa and Purnea districts are highly inaccessible (12-16 km from any railway station). The region comprising the entire Varanasi district (excepting Chakia taluk) and most of Ghazipur, Jaunpur and contiguous Allahabad districts and the area around Patna are most accessible (5 km).

The vast tract of the eastern doab covering districts of Azamgarh, Jaunpur, Ballia and parts of Allahabad, Pratapgarh, Gorakhpur, Deoria, Ghazipur and Varanasi in the lower U. P. Plain and the compact zone of western portion of Patna, northern Ganga and north-eastern portion of Allahabad and contiguous southern portion of Sahar and Mirzapur districts form two blocks of high densities of surfaced roads with over 1 km of

climatic differences are accentuated by the development of certain infrastructural elements or economic processes of development and level of utilization of certain resources.

As in the case of the Upper Ganga Plain, the Ganga functions as the main divide resulting into two first order regions, i.e., (i) The Middle Ganga Plain North, (ii) The Middle Ganga Plain South, further divided into six second order and fourteen third order geographical regions (Fig. 5.39).

7. Middle Ganga Plain North

- (a) Ganga-Ghaghara Doab :
 - (i) Ganga-Ghaghara Doab West
 - (ii) Ganga-Ghaghara Doab East
- (b) Saryupar Plain :
 - (i) Tarai
 - (ii) Saryupar West
 - (iii) Saryupar East (Saran Plain)
- (c) Mithila Plain :
 - (i) Himalaya Foot-hills
 - (ii) Mithila Plain West
 - (iii) Mithila Plain East
- (d) Kosi Plain :
 - (i) Kosi Plain West (Saharsa Plain)
 - (ii) Kosi Plain East (Purnea Plain)

8. Middle Ganga Plain South

- (e) Ganga-Son Divide :
 - (i) Ganga-Son Divide West (Chakia-Chunar Plain)
 - (ii) Ganga-Son Divide East (Bhojpur Plain)
- (f) Magadh-Anga Plain :
 - (i) Magadh Plain
 - (ii) Anga Plain.

The Middle Ganga Plain North

Excepting the Siwalik chunk in the north, the Middle Ganga Plain North is a level riverine plain characterised by deeper alluvial filling (over 2000-8000 m), lower average gradient (8 cm per km), generally fertile alluvial soil, mostly induced vegetation but denser groves of fruit and other trees, lack of minerals, predominance of agricultural activity with a venter of agronomic industry, mainly sugar, high density of population (406 per km²), very low urbanization (5.68%)

and preponderance of rural settlements. The region covers 70.1% of the total area of the Middle Ganga Plain with 74.4% of the total population. It also carries greater density than the Ganga Plain South (349) but with less than one-half of the level of urbanization (11.49%). The Ghaghara, the Gandak and the Kosi, the three most important tributaries of the Ganga in this region, offer a natural four-part division to this plain : (a) The Ganga-Ghaghara Doab, (b) The Saryupar Plain, (c) The Mithila Plain, (d) The Kosi Plain.

The Ganga-Ghaghara Doab is a triangular region with its apex on the Ganga-Ghaghara confluence in the east and the base formed by the western regional boundary of the Middle Ganga Plain. The alluvial filling is shallower (2,000-3,000 m) than the other northern plains and the water table is lower. Except in the *Khadar* tract of Ballia Doab, the area is mostly *Bhangar* with usar-infested east-west zone in the middle. The region is the driest (100-120 cm. rainfall) in the Middle Ganga Plain, but 30%-60% of the net sown area is irrigated, 60%-80% by surface and tube-wells, giving rise to a high crop intensity (125-140 or more index). It has no forest cover and abnormally low pastures and grazing lands. It carries a higher overall density (423) and urbanism (8.92%) than the regional average of the Middle Ganga Plain. The Gomati divides it diagonally into two parts, (i) the Ganga-Ghaghara Doab West and (ii) the Ganga-Ghaghara Doab East. The latter is more riverine and apart from wells and tubewells it also gets canal irrigation from Dohrighat and Tanda pump canals and the Sarda canals, growing more rice and wheat than the latter. The latter, however, has higher urbanisation, Varanasi being the regional capital, with such industrial units as Sahupuri and Manduadih. It is also more accessible with better rail (both broad and metre gauge) and road net work providing direct linkage, east-west and north-south. It is also more developed, economically, professionally and institutionally.

Saryupar Plain : Across the Ghaghara is the Saryupar Plain which is more humid (120-150 cm rainfall), riverine with *Khadar* tracts, *tals*, oxbow lakes, and deserted channels, high water

table, more flood-prone and subject to the capricious nature of the Ghaghara, the Rapti and the Gandak. Though very anciently settled, its geographical isolation has always been subjected to political vicissitudes and anarchy leading to mass desertion and renewal of jungles, so that the region is still a pioneer fringe in its northern part. Until the British occupation, the region was never under any central power after the ancient period.

Based on the nature of hydrology and alluvial morphology as well as level of economic development, the region can be divided into (i) *Tarai*, (ii) *Saryupar West*, (iii) *Sarayupar East* (Saran Plain). The former two sub-regions lie in Eastern U. P. and the latter in N. Bihar. The *Tarai*, an east-west strip (15-25 km wide) south of the Indo-Nepal boundary, is a low, marshy stretch of land with low gradient (1.8 m or less per km), infested with reeds, tall grasses or forests under natural conditions, criss-crossing and rather obstructing drainage, marked by high water table (3-4 m in summer) and fertile, though highly leached soil with excessive moisture and high clay factor. Rice, wheat, pulses, oilseeds and jute thrive well, and unlike U. P. as a whole, *kharif* crops rather than *rabi* predominate here. Inter-fluves, levees and alluvial cones offer sites for human settlements. The region is less accessible and is still a pioneer zone, subject to reclamation, and carries a lower population density (less than 200 per km², increasing eastwards to 250-300). There is no town worth the name : Nautanwa, Naugarh, Badhni Bazar are important trade centres; while the region also takes advantage of Padrauna, Maharajganj, Anandnagar (Pharenda), Utraula, Balrampur, etc., immediately to the south; and Gorakhpur is the regional capital.

The *Saryupar West* covers Deoria, Gorakhpur and Basti districts and Balrampur and Utraula tahsils of Gonda, all south of the *Tarai*. Rice is the dominant crop with sugar in the east and wheat and gram in the centre as the second crops, while maize and wheat become important in the west. It is the sugar zone of Eastern U. P., with highest concentration in Deoria. Other agro-industries include rice, dal and oil mills; there is a jute mill at Sahjanwa. Gorakhpur is the regional

capital with its university; it is also a railway junction with a large railway engineering workshop, a fertilizer factory and various consumer goods and light engineering units. The region will be benefited by the Gandak irrigation and power project in the east. Basti, Deoria and Balrampur are the other important centres. The *Saran plain* is also coterminous with the Saran district of Bihar and lies in the fork of the Gandak and the Ghaghara. With its rich *Bhar* soil, it is an important agricultural area having rice, maize and sugarcane as dominant crops; irrigation is provided mostly by wells. It is the most important sugar industry area in Bihar. Chhapra together with Revelganj (88,000), is the most important trade and educational centre. Siwan (27,000) is an important junction of roads and railways and trade centre.

Mithila Plain : Excepting the Siwalik chunk in the north Champaran, Mithila Plain is a dead level highly riverain tract merging with the *Tarai* of Nepal in the north and with a levee-and-Khadar zone near the Ganga in the south. The Gandak and the Kosi form its western and eastern boundaries respectively and the Burhi Gandak cuts it roughly into two halves running Northwest-Southeast. The region is a fertile agricultural tract. It carries the highest density (445) in the entire Middle Ganga Plain but is very little urbanized (4.86%). Rice is predominant, while maize in the south and sugarcane in the north are second crops, other crops being pulses, barley and *Khesari*. Fruits (mango and *litchi*) are widespread. It also forms, with the Saran Plain, the sugar belt of North Bihar. The region is divided into (i) the Himalayan Foot-hills, (ii) *Mithila Plain West* and (iii) *Mithila Plain East*. The *Himalayan Foot-hills* has moist deciduous forest with bamboos and grasses; the cultivation here is patchy, with rice as the main crop, in clearings and valleys. Settlements are small and scattered and there is no town. With the Gandak power, it promises to develop paper and other forest-based industries. The *Mithila Plain West* is distinguished from the *Mithila Plain East* because of its more diversified regional economy. It has larger number of sugar factories, oil refining,

and other petro-chemical and thermal power plant complex at Barauni, and higher urbanization, with Muzaffarpur, the regional capital and largest city of N. Bihar Plain. Muzaffarpur is the most important wholesale trade centre on Patna-Nepal route with an aerodrome on the Patna-Nepal air-route. Bettiah, Hajipur, Motihari are the other important centres. There is a double circuit 132-KV power line from Barauni through Muzaffarpur to Sugauli, and it will, with the Gandak power project, be significant factor for industrialization and agricultural mechanization in the region. Mithila Plain East is transitional between the western and eastern parts of N. Bihar, climatically and agriculturally; it lacks the Bhat soil of the west, and a large part falls under the Kosi Project Area. *Kbesari* replaces sugarcane in the northern part as second crop. Sugar is but less important and so also the extent of industrialization as compared to Mithila Plain West. Darbhanga is the chief city but is smaller and less important than Muzaffarpur.

Kosi Plain lies east of the Kosi and north of the Ganga, covering Saharsa and Purnea districts and partly Khagaria and Bhagalpur subdivisions. Being the 'play-ground' of the Kosi, it is 'a rather well-defined region with internal homogeneity'. Frequent occurrence of floods and shifts of channels have made it largely a *Khadar* land. As such, with moist climate and high water table, this region is a rice-jute tract with pulses, wheat, maize and oilseeds. Because of constant danger to crops and settled life, the region has the lowest (below 60%) percentage of net sown area in the Middle Ganga Plain and is also less densely populated (305). There is little urbanism (4.93), less accessibility and few industries; in fact, until the recent containment of the Kosi, the region has been a tract of high drainage disability. The Kosi Project is likely to enhance the agricultural and economic prosperity as is evidenced by the fact that Saharsa and Purnea recorded over 30% increase in population during 1951-61, while they had suffered loss during 1901-1950. The region is easily distinguished into (i) *Kosi Plain West* (Saharsa Plain) and (ii) *Kosi Plain East* (Purnea Plain). The Kosi Plain West

has lower percentage of net sown area (54) than Purnea (62), and has also higher percentage of barren and uncultivated land (8) as well as of cultivated waste (12). Jute which has second position in Purnea is replaced by maize in Saharsa and occupies third position. Saharsa is also less urban (3.9%) than Purnea (6%). South Purnea, the heart of jute cultivation in Bihar, has two large jute mills and a match factory at Katihar (59,000), which is an important nodal and railway centre on the Kanpur-Assam, Nepal border (via Forbesganj)-Purnea, Manjhi Ghat to the South of the Ganga and Malda-Dinajpur (West Bengal) routes. Purnea (41), Forbesganj (16), Araria (14) and Karba (13) in Purnea district and Supaul (18), Saharsa (15), Madhopura (13), Murliganj (10) in Saharsa are other important centres.

The Middle Ganga Plain South

The Middle Ganga Plain South covers about 30% of the area of the Middle Ganga Plain but carries only 24% of its total population with a lower density (335). It has thinner alluvial veneer, mostly less than 1500 m deep and has higher gradient, with several projections of the Southern Uplands. It has, however, fertile alluvial soil cover, higher irrigation (with canals and indigenous pynes and *ahars*, etc.), higher urbanization (11.49%), high rail and road accessibility with certain trunk routes north-south and east-west, more industrialization and higher level of economic development. Having a very large east-west extent, it has wide variations in terms of rainfall—the eastern zone touching the wet zone and the western part partaking subhumid characteristics. The Son has been a traditional physico-cultural divide, forming two regions: the (e) *Ganga-Son Divide* in the West and (f) *Magadh-Anga Plain* in the east; geographically, however, the Lower Son Valley from the Rohtas Plateau downstream is sandwiched between these two parts and functions culturally and economically as a zone in transition. It is not only the most irrigated (by the Son canals and tube-wells) and agriculturally the most prosperous zone, but it has also the highest industrial development. Based on the rich Rohtas limestone (84% content),

it has the largest concentration of cement industry with factories at Banjari, Japla and Dalmianagar; the last is a large industrial complex of cement, asbestos-cement, paper and pulp, sugar, vegetable oil and chemicals, etc. Based on the Damodar (also hydel) and N. Koel basin coal, and great transportation facility, enhanced by the road bridge on the Son at Dehri, this region has high prospects.

The Ganga-Son Divide is an agricultural region as a whole and has two lower-order regions—(i) the *Chakia-Chunar Plain* to the west and (ii) the *Bhojpur Plain* in the east, the chief dividing line being the Karmnasa river which also marks the Uttar Pradesh-Bihar State boundary in this part. Chakia-Chunar Plain is broader in Chakia-Chandauli area and narrows towards the west to 15 km only, the foot-hills actually buttressing onto the Ganga at places. The western half is drained by smaller streams such as the Harrai, Chatar, Jargo, etc., from west to east. Canals taken out from the Karamnasa and Chandraprabha irrigate the broad alluvial flats of the Chakia-Chandauli Plain. It is this area from which the Patna-Moghalsarai-Allanabad broad gauge railway passes. Mirzapur is the chief centre, though Chakia-Chandauli Plain is served mostly by Varanasi. The *Bhojpur Plain* is coterminous with the Shahabad plain, and is a prosperous rice dominated agricultural area. Both the Grand Chord and Calcutta-Delhi Main Line, as also the G. T. road pass through this plain; it has also the Sasaram-Arrah and Dehri-Chutia light railways. Arrah (77,000) is the chief town, although located eccentrically, while Dehri (with Dalmianagar complex), Sasaram, Buxar, Dumraon, Bhabua, and Bikramganj are other centres. The Indrapuri Barrage on the Son would enhance the agricultural prosperity of the southern part of the Bhojpur Plain.

The *Magadh-Anga Plain* is historically an important region lying east of the Son. Each was anciently a separate kingdom but they also merged at times, and although there has been a good deal of cultural exchange between the two, sufficient dichotomy exists to divide the region into (i) *Magadh Plain* and (ii) *Anga Plain*. Magadh Plain is the culture area of Magadhi dialect and

Patna, Gaya, Rajgir and Monghyr have been its hinge points. Being a notable agricultural area with rice, *Khesari*, pulses, wheat and maize as important crops, it has also clusters of agro-industries (rice, *dal*, oil, etc.) in different towns. Patna and Gaya are important, not only as university centres, but also for having textile, light engineering, and various consumer goods and agro-industries. Bihta and Gaya have also sugar mills, while Monghyr is famous for one of the largest cigarette factories in India, apart from its traditional gun-making works. Jamalpur (57,000), an industrial town, has one of the largest railway engineering workshops. The *Anga Plain* is a small region and is agriculturally distinct from other sub-regions of the Middle Ganga Plain South in having the highest dependence on indigenous systems of irrigation. Rice is dominant with maize in the north and *Khesari* in the south as important crops. It has adequate accessibility. Bhagalpur city, with its University, agro-industries and *tassar* silk industry, is the most important trade centre of the region.

Prospects and Problems

The foregoing analysis has set forth many problems of the Middle Ganga Plain and its people, essentially arising out of the geographic setting in which their culture, economy and history have nourished themselves. Though it is a region in its own right, it is highly diversified in its different parts which all have their specific geographic settings, problems and resources. There have emerged not only regional but also sub-regional and local problems which demand solution. What is needed is an integrated approach for the regional problems with well-studied and problem-oriented spatial and temporal priorities. Problems are hydra-headed due to social disabilities and historical antecedents, while the resources at hand, at least the capital and technological resources that are needed for quicker economic development in a democratic system, are limited. The pace of development is disgustingly slow; sometimes stand-still and actually sliding back as in 1966-1968, while the enormity of the problem is aggravating fast.

There is enormous population problem, with all its train—food, malnutrition, disease, health, education, employment, etc., and there is land problem; diminishing parcels of holdings or per capita land is pressed hard against the increasing population load because of lack of alternative channels of livelihood. Secondary and tertiary sectors of the economy have really yet to rise to bear weight in the regional economy.

However, the potential resources are rich, both physical and human, but they have yet to be developed by readjustment of landuses and channelised to produce wealth not only for consumption of the fast growing population but also to raise capital for investment for further growth. The land has borne greater burden than ecologically permitted under agriculture; there are almost no forests, or grasslands or pastures and grazing lands, and the agricultural yield is one of the lowest, which is as much a result of scattered fields and uneconomic holdings, and lack of soil management and investible capital in agricultural improvement as paucity of water and power and scope for proper utilization of land, and development of marketing facility, rural roads, etc. The provision of the dependable supply of supplemental water, electricity and road, the *sine qua non* for agricultural progress, as has been evidenced by the little Green Revolution that has set in during the last few years, and then massive efforts at cooperatives, supplies of credit, fertilizers and small tractors (as used in Japan), processing of agricultural raw material locally, manufacturing and other tertiary business channels, and a host of others will be needed. The agricultural and other rural primary activities such as forestry and

dairying have to be essentially integrated with industrial and urban development and a proper country-cum-town development process has to be initiated.

The agricultural resources and savings should be tapped for agricultural development as also for channelising into industrial and social sectors to generate community efforts for social and economic developments. Improved economy of this region means a solid modernized agricultural base with industry and tertiary activities developed on this base without pressing that sector to disadvantage. A modernized and intensively labour-absorbing cottage and small scale industrial sector may be profitable for balanced rural development, while the large scale capital-intensive industrialization may set the process of urbanization without causing crisis.

Measures for river control and harnessing of rain water should be given top priority on a regional scale. Ground water resources and soil conservation are other significant aspects which call for attention.

Rural education is to be oriented to vocational and technical training so that local opportunities for employment based on available local resources are generated.

The traditional tourist industry based on several centres of historical, archaeological and religious importance has to be further boosted by capitalising on these cultural resources through the provision of the ingredients and infrastructure of tourist industry. This will bring in its chain an appreciable, though largely invisible, prosperity to the regional economy, specially through servicing and handicraft manufacturing and sales.

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The Lower Ganga Plain, in real sense of the term, includes the Kishanganj tahsil of Purnea district (Bihar), whole of the West Bengal State (excluding the Purulia district and the mountainous parts of Darjeeling district) and most of East Pakistan as well. Though the whole of this Plain is now perceived as deltaic, the real delta constitutes about two-thirds of this Plain lying to the south of the Rajmahal-Garo alignment and which together "is probably the largest delta in the world".¹ Much of the plain though now falls in East Pakistan, its historico-political evolution as a whole can hardly be treated in isolation.

The region (21°25'-26°50' N; 86°30'-89°58' E) embraces an area of about 80,968 km², extending from the foot of the Darjeeling Himalaya in the north to the Bay of Bengal in the south (maximum stretch about 580 km) and from the edge of the Chotanagpur Highlands in the west to the border of East Pakistan and Assam in the east (maximum stretch about 200 km). In the west, 150 m contour roughly corresponds with the boundary while in the east the international boundary with E. Pakistan is maintained (Fig. 6.1). Old mud, new mud and marshes correctly define its topography in a nut-shell. This deltaic setting, coupled with per humid climate, is responsible for the crystallization of a way of life of the people distinct from the rest of the Great Plains.

Historical Background

The Lower Ganga Plain is only a small part of the former political and physical stretch, the *Vanga*² of the Vedic literature which constituted a part of the *Prachya* region (Eastern region) of the *Aitareya Brahmana*, and the Lower Ganga Plain or more specifically the Bengal Delta of

geographers. The region is said to have been inhabited by and belonging to the Proto-Indics or Proto-Australoids (Nisadas, Kiratas, Bharatas and Savaras),³ the Kiratas occupying the northern tracts, the Bharatas (Pundras), the central portion (the Barind tract) and the Nisadas and the Savaras, the S.E. and S.W. tracts respectively. Thus, the pre-historic set up of the region is related to the ruling tribal chieftains who later are mentioned as degraded Kshatriya (Mahabharata) occupying the forested tracts with agricultural pockets. The Aryanisation of the region is of later or post-Vedic period as "the Vanga state, lying in the Lower Ganga Valley appears to be the extreme eastern territory known to the Aryans".⁴ Major process of forest clearings accompanied the eastward march of the Aryans through burning and pushing out the tribals further into interiors and fringes. In addition to the Aryans, the region experienced the influx of another race (A. D. 10th century) the Mongoloids from the North and North-East through the Chumbi valley and the Brahmaputra valley, prominent being the Kambhoja, a Himalayan tribe from Tibet. Up to this period the prominent dynasties which ruled over this plain were the Pundra, the Pala, the Sen, the Konch, etc., all of which used to be contemporary to each other with one of them succeeding at times to establish some sort of suzerainty over the whole or part of the territory and even over Anga, Magadh, etc.; notable among them were Dharm Pal, Ballal Sen, etc. The state of affairs led to economic prosperity and social cohesion. The region used to form the fringe areas for even the powerful Magadh and Delhi empires as Samtata, Davaka and Kamrup (Allahabad Pillar inscription) are mentioned as the frontiers of Samudragupta's



empire but there are relics of later sway of the Guptas in Dinajpur, though the sovereignty was short-lived. Even Huen Tsang (A.D. 7th century) mentioned the four capitals, i.e., Pundravardhan, Samtata, Karnasuvarna and Tamralipti as the prosperous kingdoms of the region.

The *Vanga* had a great trading and commercial centre in the Hooghly-side, and its ancient sea-ports, i. e., Tamralipti, Satgaon, Sonargaon, etc., adorning the large sea-board, developed, on the one hand, international maritime connections with Kamboja (Cumbodia), Subarnabhumii (Burma), Taprobane (Ceylon) and the ports of Deccan and Persian Gulf, and provided, on the other, through the Ganga and its tributaries, inland links as far as up to Taxila. These links acted now and then as significant forces upon the social and political frame of the region also. Thus, there was marked development of the economy as also of the art and culture under the Hindu regime up to the 12th century. Since the close of the 12th and the beginning of the 13th century, the region witnessed the rules of series of muslim potentates owing more or less allegiance to the Hindu Kings and later to Delhi Sultans and the Moghuls. In the writings of the Moghul period it has been described as the 'Paradise of India'. It had been so even to the foreign travellers as "from Ibn Batuta downwards Bengal was the richest store house of natural beauty, opulence and artistic excellence".⁵ It is notable that the region seldom gave the invaders permanent footholds and preserved as such the character of the 'home of rebels and refugees'. However, the Muslim powers could succeed in a mass scale conversion of population in the eastern section of the deltaic plain. Owing to its relative isolation from the political nucleus of the country, the region was able to develop an indigenous art, culture and craftsmanship, some products of which, like the Dacca—muslin became coveted items in the world market representing as they did supreme technical skill.

Unlike previous culture waves, the last exotic elements to influence the Lower Ganga Plain came from the Western Europe through its sea-

board. This distinctly different wave included the Portugese (early 16th century), Dutch (1632), French (1673 or 1676), Danish (1676) and British (1690). The British, however, put an end to the Muslim rule at the battle of Plassey (1757) which was finally confirmed at Buxar (1764). Thus, this frontier region became the core of a sea power with its centre at newly fortified city of Calcutta around Fort William. The initiation of the British rule was marked by the recurrent strifes between the local Nawabs and the British and the people had to suffer the repercussions of the 'Dual Government' accompanied by the historic Famine (1770). The region was provided however, with the advantages of new innovations in industrial, commercial and other fields. The Hooghly-side still retained its supremacy in trade, commerce and industry. Though the capital of the British Power in India shifted to New Delhi (1912), Calcutta continues to be the commercial capital of India. Rightly enough, Calcutta is more to Bengal than any city in the world could be to its region and people.

Thus the process of racial miscegenation and cultural diffusion, together with the frequently changing river courses and the proximity to the sea have definitely provided the region a unique ecological system to identify it as a distinct unit in the Great Plains of India.

The Physical Setting

Geology

Although the making of the Lower Ganga Plain in general and the delta in particular is a product of fluvial action (alluvial and diluvial), the platform for this action was set through the tectonic activities associated with the recent (Tertiary) phase of the earth's orogenic epoch resulting in the formation of the Trans-Eurasian lofty mountain chains. The formation of the Himalaya created a trench-like trough on to its south (the Sindhu-Ganga trough), while the upwarp of its counterpart—the Arakan Yoma-Andaman-Sumatra are aided the formation of the Bay of Bengal due to subsidence. Thus, under the two tensional forces, i.e., from the Sindhu-Ganga trough in the north and the downwarping

of the Bay of Bengal in the south, the pre-existing narrow neck of the Peninsular landmass founded, resulting in the formation of the Rajmahal-Garo gap ultimately diverting the waters of the Siwalik river southward into the Bay of

Bengal (Fig. 6.2 Inset). No doubt, the action was, in part, supplemented by the upwarp of the Delhi Ridge. The existing lacustrine tract between the Rajmahal and the Garo Hills may also explain this episode which was followed by the laying

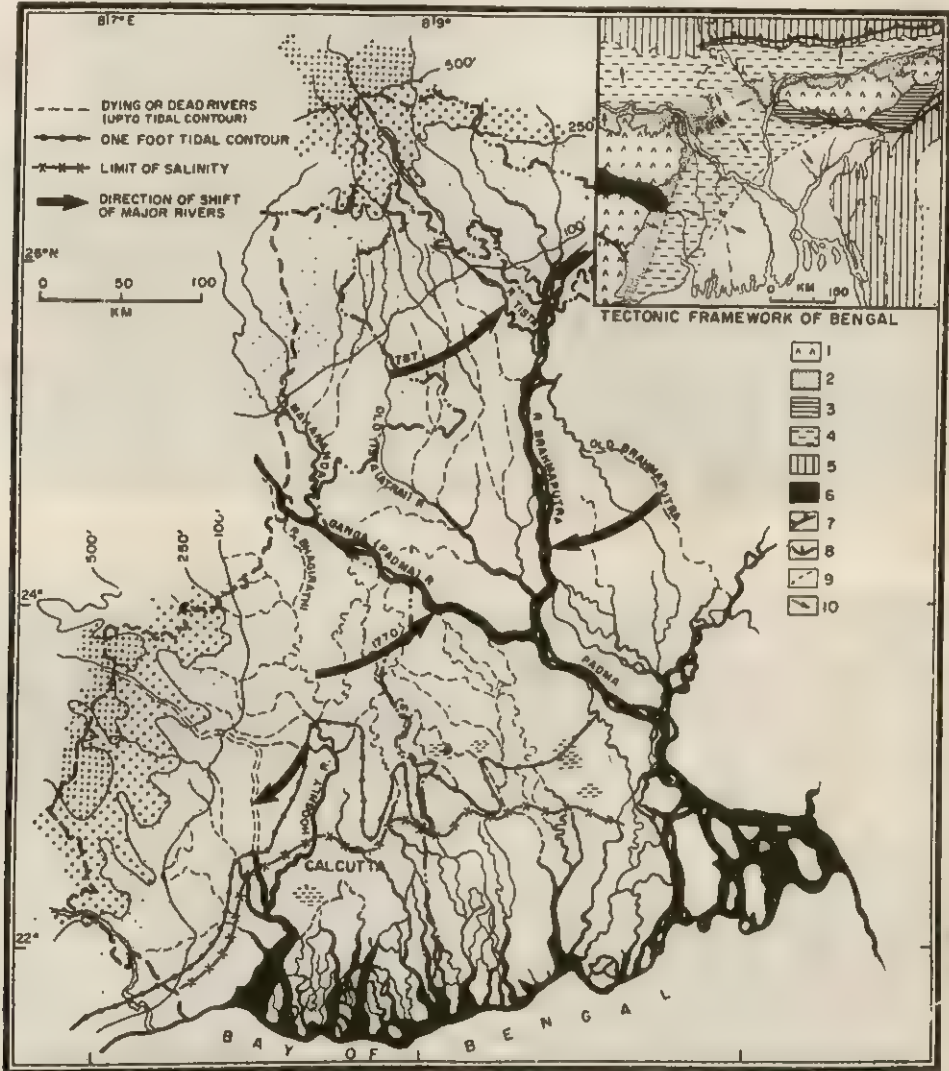


Fig. 6.2 : Relief and Drainage characteristics in the Bengal Delta

Index to Inset : 1. Exposed Shield. 2. Buried Shield. 3. Uplifted Segments of Zone 4. 4. Transitional zone between Shield and Geosyncline. 5. Orogenic Belts. 6. Gondwana. 7. Thrust Fault. 8. Normal Faults. 9. Hinges in the Basement. 10. Direction of slope of Basement.

down of the recent (late Pleistocene) alluvium and successive southward march of the delta plain. There is conspicuous absence of older alluvium in the delta region, which is quite extensive in the northern parts of the region. This accident did aggravate the actions of the tributaries coming from the Himalaya, and the physical landscape was reshaped to some extent owing to the instability introduced in the river regimes.

This rather major event was sufficient to disturb the isostatic equilibrium of the earth surface locally and the result was the recurrent subsidence, alluviations, river diversions, etc., and shaping and reshaping of the deltaic and other consequent landscapes of the Lower Ganga Plain in general and of the southern part in particular. The well-developed beds with erect roots of Sundri trees, peat etc., occurring at about 6-11 m and 150 m below the sea level do testify the regular subsidence of the deltaic region. The western margin is, however, covered by laterites and Gondwana formations, the latter being exposed in the Raniganj region of the Damodar basin (Fig. 6.2 Inset).

Relief and Drainage

Topographic expressions in the region hardly speak of any well-defined stage of their evolution. The monotonous surface is dissected frequently by the channels of the tributaries or distributaries of the main streams, i.e., the Ganga and the Brahmaputra. This tract of recent alluvium, on detailed investigation, presents at least four areas where the relative relief is somewhat significant (about 12 m to 30 m). These are (i) the Malda West Dinapur tract where the inliers of the lateritic alluvium are sufficient to break the general monotony of this Plain; (ii) the tract bordering the Chotanagpur Highlands where the Gondwanas and the lateritic alluvium are found; (iii) the Midnapur Coast where the sand dunes on the terraces appear to be more significant elements of landforms, though of a micro order, and (iv) the *Duars* of Jalpaiguri and Darjeeling, comprising the submontane tract. Elsewhere the *bils*, the swamps and marshes and the levees are the

only remarkable components of the physical landscape (Fig. 16.2).

The tract SW of the Hooghly-Bhagirathi basin has a comparatively shallow basement characterised by a series of sub-surface ridges. This is the only belt of pre-Cambrian metasediments in the region. The surface is criss-crossed by numerous rivers with meander scars, valley fills, etc., illustrating its complex origin. The coastal landform (Midnapur coast) reveals the effects of the changing sea level and the north-easterly winds sweeping the coast. The old coast-line lies about 11 km inland and the Digha beach at present is flat and has a straight shore line which, under the influence of the littoral drift, is being eroded away rapidly (cliff erosion). There is hardly any backshore left (Fig. 6.3 inset). The same littoral drift, being parallel, is responsible for the accretion on Orissa coast. As many as four⁴ parallel lines of dunes can be observed here, some of which rise to about 13 m above the ground and are 45-75 m wide. These dunes are partly stabilised.

To the east of this shore line lies the deltaic bulge of the Ganga (Sundarbans) where the depositional activity of the streams is prominent and new surface is being continuously added.

Apart from the lateritic inliers, the northern part of the region is marked by the surface forms designated as (1) the *Duars* (Darjeeling Tarai), similar to the tarai of the Upper Ganga Plain and (2) the Barind plain, a tract of older alluvium between the Kosi-Mahananda corridor in the west and the river Sankosh in the east. The Barind tract also shares partly the characteristics of the rest of the plain as all the important streams such as the Kosi, the Mahananda, the Tista, the Karatoya, etc., make frequent swings in the area.

The easterly shift of the Ganga (1787) has rendered the area, comprising the district of Nadia and Murshidabad east of the Bhagirathi-Hooghly, a land of dead and decaying rivers. Only in 24-Parganas is delta building still active.

Of considerable interest is the low altitudinal position of the region where the great agricultural and industrial complex seems to have grown paradoxically as can be inferred from the obser-

PLATE V



Rural Landscape near Sarnath



The main commercial centre of Raipur



Rice plantation in Sonarpur, Arapanch Basin



Interculture of Corn and Spinach in Dhapa

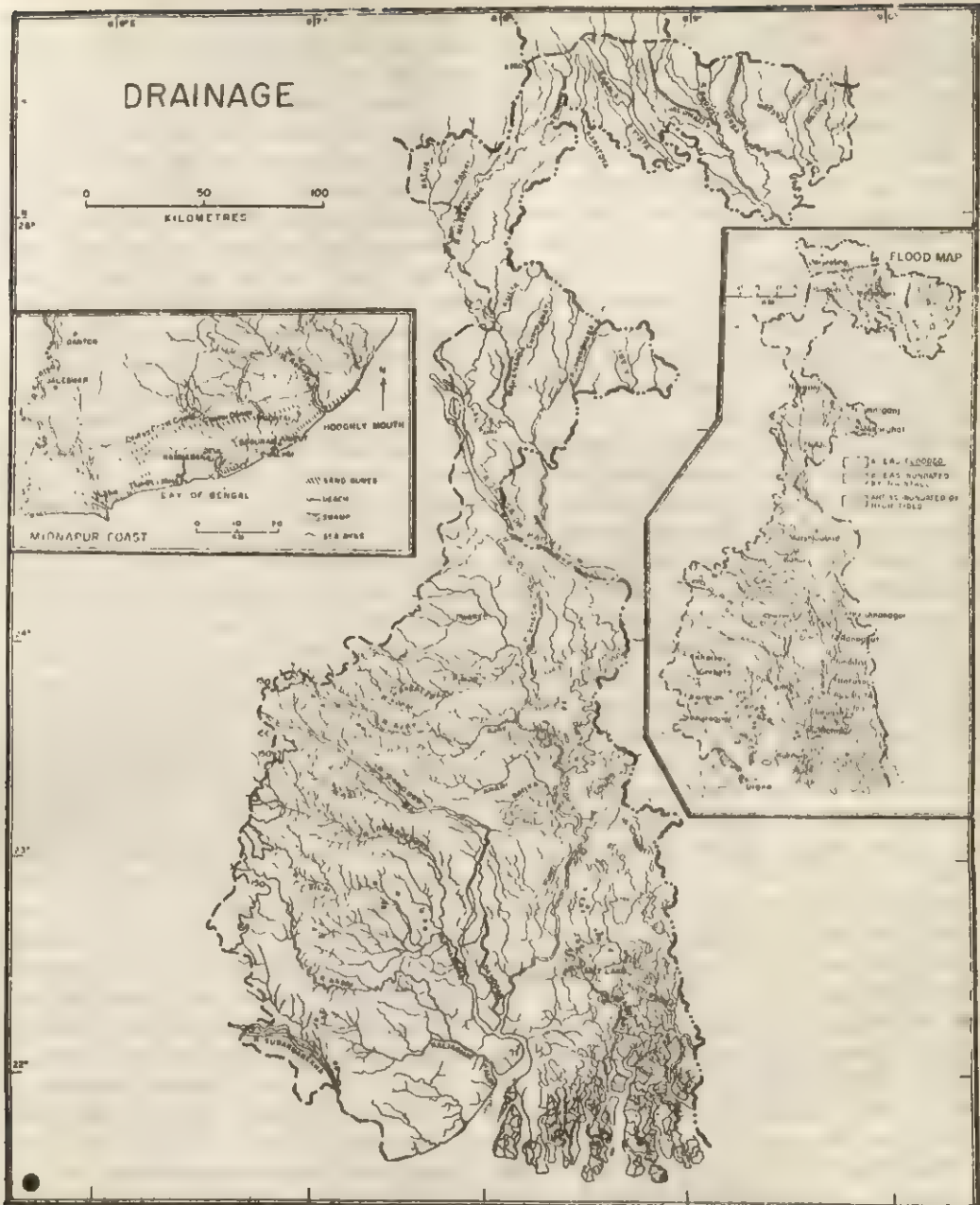


Fig. 6.3

various made for Calcutta by a noted traveller of the 18th century : "...no worse place could be found in the whole of Lower Ganga Plains for

the location and inception of a city of the stature of Calcutta, which became the core of great industrial conurbation of the Indian sub-con-

tincent"? Though the northern and western fringes lying in Jalpaiguri and Darjeeling and Birbhum, Burdwan, Bankura and Midnapur respectively encompass areas slightly above 150m, more than two-thirds of the surface constituting parts of Cooch Behar, Dinajpur, Malda, Murshidabad, Nadia, Hooghly, Birbhum, Howrah, 24-Parganas and Midnapur etc., have an elevation within 30 m. Even a 7m high tide is sufficient to submerge the region up to Calcutta (inclusive). The saline water expanses in the vicinity of Calcutta testify the recent withdrawal of the sea and occasional march of the tides in this region. Within this low-lying area the gradient is rather imperceptible.

The general slope of the Lower Ganga Plain, as revealed by the drainage system, is to the south-east which is natural in a hinge zone trending NE-SW. But the sharp southerly turn of some of the rivers in the region can be explained by the postulation of a gradual change in basin axis from east-south-east to south-south-east rather than by the hypothesis of the gradual southerly tilt of the delta which would hardly have allowed the easterly migration of the main channel of the Ganga (Padma). The Delta proper has a gradient of less than 2 cm per km while the areas in the immediate vicinity show gradients up to 40 cm. Only a narrow strip along the northern border of the region exhibits gradients up to 100 cm.

Thus, the histogenesis of the landform as also largely of the human occupance of this region is a function of the tectonics, changing river channels, sea level changes, etc.

The micro order diversities within the apparently homogeneous physical entity bring out the following physiographic subdivisions : (i) the Northern Plain comprising two distinct landforms (a) the *Duars* and (b) the Barind tract; (ii) the Delta Proper comprising (a) the land of dead and decaying rivers (Moribund delta) in the north (Murshidabad and Nadia), (b) the Active delta of the Sundarbans and (c) the Mature delta (parts of Birbhum, Burdwan, Midnapur, and entire districts of Hooghly and Howrah); (iii) the western margin of the delta called the *Rarh*

Plain where the lateritic alluvial landscape along with the coastal scenery at Digha beach has developed (Fig. 6.3 Inset).

Drainage system of the region is constituted by the tributaries and distributaries of the Ganga and the Brahmaputra, alongwith some insignificant systems (the Kasai, the Subarnarekha, etc.) discharging into the Bay of Bengal and draining the south-west part of the region. Conspicuously enough, the Padma and the Bhagirathi, both distributaries of the Ganga, delimit the areas prone to the action of the distributaries within the fork and that of the tributaries outside it. A host of streams, such as the Mahananda, the Karatoya, the Tista, the Sankosh etc., descend from the Himalaya and rush to their main streams almost parallel, a pattern common to the Himalayan rivers east of the Kosi. The NW opening forks, common to the systems west of the Kosi, are insignificant in these basins, though both the groups are similar in their flow, siltation and east-west oscillation characteristics of the channels. The Tista, a prolific Himalayan stream joining the Padma till 1787 suddenly drifted eastward to join the Brahmaputra. The overfloodings in the *Duar* and the Barind tract are the result of the sudden break-in-slope at the junction of the foothills and the plains as also in its counterparts to the east and west.

To some extent, more adjusted to structure in their upper, and with aggradational characteristics in the lower reaches, are the streams draining the *Rarh* Plain, notable among them being the Mayurakshi, the Damodar, the Dwarkeswar, the Kasai and the Subarnarekha, the first three belonging to the Bhagirathi-Hooghly system. The Damodar and the Dwarkeswar are more active in swinging their courses, and a significant impact of the southerly sweep of the Damodar to join the Hooghly south of Calcutta, about 150 km downstream from its previous confluence, has resulted in the accelerated silting of the Hooghly channel which had already suffered a set-back owing to the eastward migration of the main channel of the Ganga (Fig 6.3).

The Padma-Hooghly fork is the belt of the distributaries where the to-and-fro swing of

the streams associated with other conditions have given rise to *bils*, *bairis*, ox-bows and marshes. The moribund delta also owes to the frequent easterly shift of the streams. The Bhagirathi-Hooghly system, taking off at an obtuse angle, probably occupies a weak zone, perhaps resulting due to the change in the basin axis (Fig 6.2).

The drainage systems of the region when analysed chronologically, which is necessitated to correlate the evolution of landform in such an area of shifting river courses, reveals that the whole of the Bengal Delta had two distinct systems, i.e., the Ganga system with Hooghly as the main stream joining the Bay near the Sagar Island and the Brahmaputra system, skirting the Meghalaya Plateau and joining the Bay a little north of Chittagong. It is also believed that before the Rennels' drainage survey (1765-73) the Bhagirathi lay further west and flowed through the deserted channel, the *Adi Ganga*. The changes in the main streams of the Ganga and the Brahmaputra appear to owe to the simple current action assisted by the fluctuating water supply, though the process might have been later accelerated by other phenomena, particularly tectonic. The Brahmaputra reveals a westward shift and now skirts Dacca district on its west and joins the Padma. The Padma, though reflecting an example of simple water action, has now emerged as the main channel which probably owes to the post-Pleistocene uplift of the basement complex in this part which provided sufficient 'vigour to prograde' its valley. This is clearly reflected in the difference of about 15 m in the levels of the two streams, i.e., the Padma and the Bhagirathi immediately downstream from their take off. With the voluminous discharge and shorter course the degradational activities had been accelerated in the former.

The shifting courses have their significant impact on the human occupancy of the region. The ancient centres of trade and commerce like Sonargaon, Satgaon, Tamralipti etc., have lost their significance, and there is constant threat to the Calcutta port and the city as the siltation of the Hooghly is increasing.

Climate

The region experiences a hot and humid monsoonal climate. The proximity to the Bay of Bengal on the south, the alignment of the Himalaya in the north and that of the Meghalaya Plateau in the north-east determine largely the climatic character, i.e., the distribution of the weather elements with respect to time and space. Irrespective of the general vagaries and mechanism of the monsoon, the spatial and seasonal distributions of the elements such as temperature, rainfall and relative humidity are too uneven.

January invariably appears as the coldest month, the temperature ranging between 17 and 21°C and increasing southward (Sagar Islands 20.4°C). The regional variation is considerably low but becomes significant when analysed with respect to the occasional cold spells accompanied with the western disturbances. The lowest temperature has been recorded in the north (2.2°C at Jalpaiguri) but in the south it is as high as 7.2°C (Sagar Islands). The temperature starts rising gradually throughout the region from February but the rise is well marked (4° to 6°C) in March (Table 1) and it continues till the end of May; the rise like other monsoon regions is checked by the outburst of the monsoon which in this region becomes active by the first week of June. Except the northern part, i.e., the Barind tract and the Duars in the whole of the region, May records the maximum average temperature (29-33°C). The central part (Asansol

TABLE 1

Station	Average monthly temperature in °C											
	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Jalpaiguri	17.1	18.95	23.0	26.0	26.9	27.45	27.8	27.85	27.55	25.7	21.95	18.55
Asansol	18.95	21.5	26.9	31.15	32.7	31.25	28.8	28.55	28.6	26.8	22.55	19.3
Krishnanagar	18.95	21.65	26.9	30.65	31.1	30.15	28.95	29.05	29.2	27.8	23.45	19.75
Sagar Island	20.4	22.85	26.95	28.9	29.7	29.55	28.5	28.45	28.55	27.55	24.1	20.85

and Krishnanagar) indicates relatively lesser impact of the proximity to either the Bay or the Himalaya even in this region of near uniformity. Conspicuously enough, the average monthly temperature shows a range seldom exceeding 5°C over a span of seven months: April to October (Jalpaiguri 25.7°—27.85°; Krishnanagar 27.8°—31.1°; Sagar Island 27.55°—29.7°).

The only exception to this generality is presented by the western margin (Asansol) of the region where the bare rock exposures contribute to a little higher May average (32.7°C). In spite of this uniformity which partly owes to the pre-monsoon showers (nor' Westers), there are evidences of occasional high temperatures rising sometimes to over 45°C (Table 1). Even these exceptional temperatures are lower in the *Duars* (Jalpaiguri 40°C) and the coastal regions (Sagar Island, 40°C).

Notably the range of temperature also corresponds with the general distribution. March and April are the months when the range is at the maximum though rarely exceeding 16°C (Jalpaiguri, 13.2°C, Malda 15.2°C, Berhampur 15.7°C and Krishnanagar 16.2°C all in March) except the coastal areas where January and December record the maximum range (Sagar Island 9.2°C and 8.9°C respectively). The temperature range is at its minimum during July and or August when atmospheric moisture imposes the moderating influences. The range for these months remains around 5°C and seldom exceeds 10°C during the five rainy months (June to October).

The gradual decline in average monthly temperature commencing often from June (September in case of Jalpaiguri) becomes well marked when it falls by 3° to 5°C between October and November. This marks the start of the winter season.

The average relative humidity is generally high (over 50%) throughout the region except in the western fringes where for about two months, March and April, it is less than 40%. This is also the period of lowest RH all over the region except the Sundarbans. December and January, however, show the minimum in the coastal tract

(Sagar Island 68.5° and 69.5° respectively). It can well be observed that during July, August and September the average RH remains over 80% which spatially decreases westward (Krishnanagar 84.2% and Asansol 82.7%). The relative inland belt away from the Himalaya and the Bay is again quite well defined. From the monthly RH pattern the oceanic influence is also distinct (range at Sagar Islands 17%; Asansol 47.5%). Mornings are invariably damper with usual regional variations. The diurnal range is maximum in the month of February (>30%) and minimum in August (<7%) when the monsoon is at its climax.

The rainfall (120 to more than 400 cm) is fairly widespread in the region though with uneven seasonal and spatial distribution characteristic of the monsoonal condition (Fig. 6.4. and 6.5). Out of the four sources of rainfall, i.e., westerly disturbances of winter, convectional overturning of air resulting in local depression (*Kal Baisakhi*) during March-May causing pre-monsoon showers, cyclonic disturbances of the monsoon and post-monsoon periods and the monsoon currents occurring along the convergence lines of the sea-level monsoonal troughs, the last two account for the major precipitation received in the region (Sagar Islands about 85%, Krishnanagar about 80%, Asansol about 85% and Jalpaiguri about 85%). But for the southern belt, i.e., the active delta, where August is the wettest month (41.0 cm.), July emerges as the wettest month of the region with rain varying between 28 cm in the Bhagirathi-Padma fork to 77.6 cm in the *Duars*. December undoubtedly is driest though with relatively damper atmosphere (RH more than 55%).

Spatially the northern and southern parts, owing to the proximity of the Himalaya and the Bay respectively, experience relatively more annual rains (Jalpaiguri 335 cm and Sagar Islands 190 cm) than the central part. It is the area bordering the Chotanagpur Highlands that experiences minimum rainfall (Asansol 139.22 cm).

The erratic nature of precipitation is evident by the fact that even the wettest months receive sometimes rain below 20 cm, eg, Asansol 5.71 cm in July, 1918; Jalpaiguri 11.43 cm. in August,

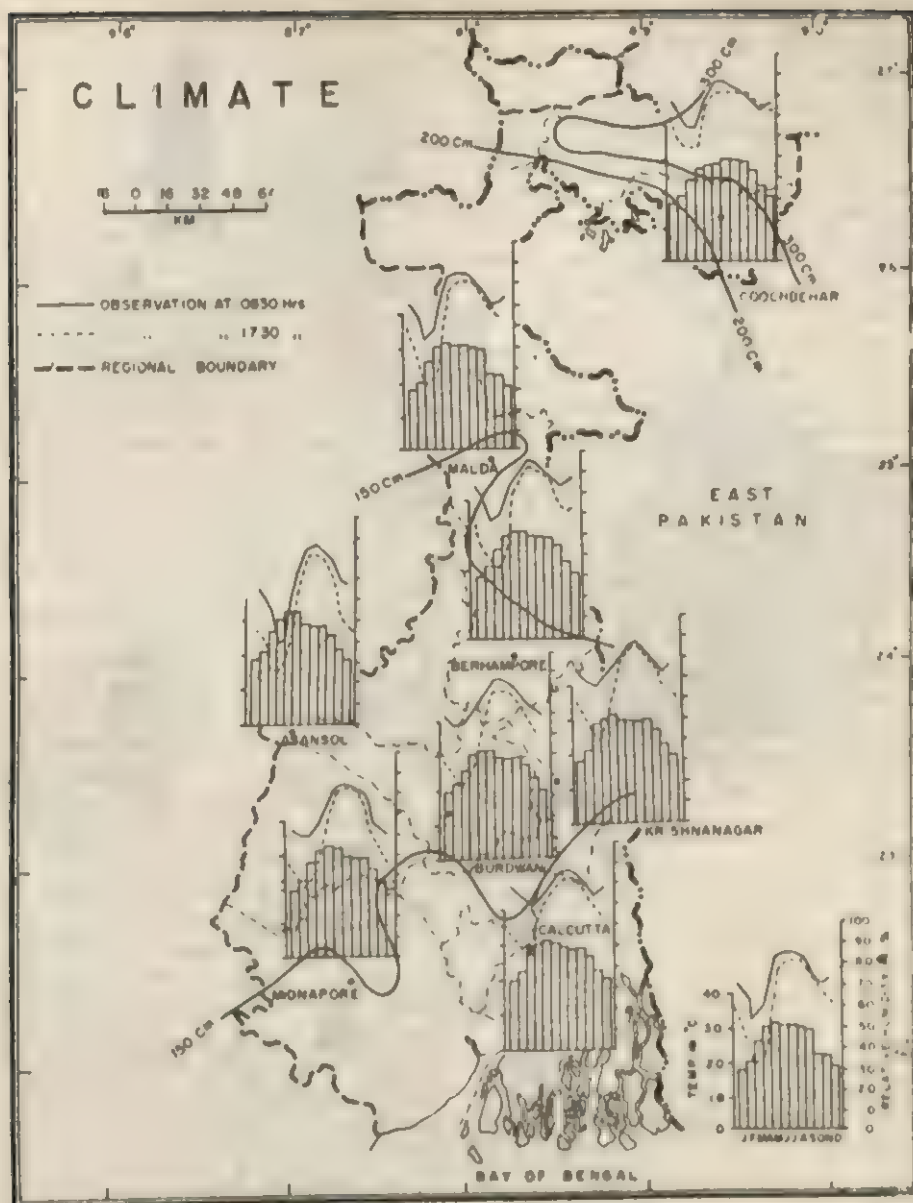


Fig. 6.4

1896, Krishnanagar 8.59 cm in August, 1892 and Sagar Islands 11.45 cm in July, 1919; while their averages for the respective months are 34.44, 66.28, 27.11 and 40.94 cm. Similarly the heavy downpours of 64.92, 151.76, 71.43 and 96.42

cm have also been recorded for stations in the respective months in the years 1943, 1958, 1909 and 1913. Even the drier months sometimes record exceptionally heavy downpours (Jalpaiguri 57.0 cm in December, 1932). Heaviest down-

pours within 24 hours ever recorded are at Calcutta 369.1 cm on September 20, 1900; Sagar Islands 359.2 cm on June 5, 1927 and Jalpaiguri 390.4 cm on July 8, 1892.

The overall impact of the climatic elements can be interpreted in terms of water surplus and deficit in the region, which have direct correlations with the agricultural economy. The seasonal surplus period, often between mid-July and end of October, is a common feature all over the area except in the *Duars* where due to the early commencement of the monsoon it starts from May end. Depending on the amount of rainfall the *Duars* show maximum surplus equivalent to about 60 cm of rain in July/August (Fig. 6.5) which aggravates the work of running water resulting in floods, shifting of river channels, etc. Elsewhere, it is below 20 cm rain equivalent being the lowest in central part (Krishnanagar about 10 cm). It is also evident that there is a general water deficiency period from January to mid-June, being shortest in the *Duars* (January-April). The soil moisture in the Active Delta is sufficient for about three months to get evaporated while in the remaining parts it can stand only for two months.

The position, though relatively better than the other parts of the country, calls for irrigation measures to be developed to ensure more intensive land utilisation and better yield in the region.

The dry summer is characterised by three air streams, i.e., the northwesterly current from the west, a shallow southerly stream from the Bay of Bengal and a feeble easterly to north-easterly current through the Assam valley, resulting in a marked instability in the atmosphere accompanied by thunder storms, dust storms, squalls, etc. Out of the 74 instances of squalls at Alipur during 1948-52 as many as 57 were recorded during March-May. Rainfall is associated with afternoon or evening thunder-showers and squalls. Hailstorms (up to 3) during the season occur in the SW part. High temperature (23-33°C) and low humidity (up to 40%) are the characteristic features. The temperature range is also the highest (16°C).

The Bay depressions bring in the monsoon by the first week of June. Series of such depressions

sweep over the region during June-October and cause heavy to moderate rainfall with July-August emerging as the rainiest months. The withdrawal of the monsoon by mid-October is followed by a short transition between the rainy and the cold season (post-monsoon season). The commencement (June) and the end of the rainy season (September/October) are associated with more thunderstorms than the rainy months of July and August. High relative humidity (70% and above) along with high and almost uniform temperature (26-31°C) and heavy downpours are the characteristics of the season. The climate is often sultry during rainy season.

The winter season is characterised by the sweep of northerly or north-westerly winds. The weather changes are associated with the occasional western disturbances causing some rainfall, but cold waves are rare. Low average temperature (17-24°C) increasing southward and moderate relative humidity (50%) mark the characteristic of the season.

The rainfall and temperature conditions have keen relationship with the jute cultivation which is too susceptible to these factors as is evident from the following findings of the correlation between rainfall and jute yield.*

Correlation
Coefficient

1. Jute yield and sowing season rainfall 3 to 25" +0.65
2. Jute yield and sowing season rainfall above 25" -0.42
3. Jute yield and sowing season rainy days 6-24 +0.78
4. Jute yield and sowing season rainy days above 24 -0.70
5. Jute yield and growing season rainfall above 70" +0.40
6. Jute yield and growing season rainfall 24-75" -0.55
7. Jute yield and growing season rainy days 34-69 +0.68
8. Jute yield and growing season rainy days above 69 -0.40

Three micro regions may be distinguished :

1. Per humid north with over 200 cm annual

rain, diurnal temperature range greater than the annual (Jalpaiguri). 2. Humid Maritime which includes the coastal parts of Midnapur and 24-Parganas, Calcutta, Howrah and part of Hooghly, experiences rainfall 200 cm and temperature range 10°C (Sagar Island). 3. Humid subcontinental includes the rest of the region. There is marked decrease in rainfall (below 150 cm) and temperature range is also high. There is, however, more continental effect in the west and two sub-regions can be delineated with representative stations as Asansol and Krishnanagar.

Soils

The soils of Bengal have been studied widely by different scholars. The studies carried out so far lead to the convenient grouping of soils as (i) Laterites, (ii) Red Earths, (iii) Tarai soils, (iv) Alluvial soils and (v) the Coastal soils, developed under their usual respective processes.

The lateritic soils (5,888 km²) are found in the undulating well-drained tract along the Chotanagpur highlands covering the western part of the region (Fig. 6.5 Inset). At places honeycomb structures of the rocks are exposed. Acidic in character (pH 5.5—6.5) and deficient in organic matter these are poorly aggregated and possess low water-holding capacity; usually Sal forests thrive.

The transported laterites deposited on the eastern flanks of the lateritic stretch are known as the Red soil (lateritic alluvium) and are found in the eastern margins of the Rarh Plain and the Barind tract of Malda and W. Dinajpur covering about 4,963.6 km² area. Morum and feldspar and sometimes lime concretions are also observed in the bed. The shallow and coarse-textured soils are acidic in character (pH 6-6.6) and are poor in organic matters and plant nutrients (N). Mostly they have been brought under cultivation after deforestation which has accelerated the process of erosion.

The unassorted materials deposited at the foot of the Darjeeling Himalaya are responsible for typical Tarai (*Duar*) soils in Jalpaiguri and Sili-guri tahsil with an areal coverage of about 6,600 km². The deficiency of plant food and organic matter and acidity (pH 5.8—6.7) are common.

By far the most important, areally (28,921.3 km²) as well as agriculturally, are the alluvial soils. The minor differences in the parent materials distinguish the alluvial soils which, though at places inter-digitated, have distinct spatial locations. The narrow alluvial strip along the lateritic and red soils in parts of the districts of Murshidabad, Bankura, Burdwan, Hooghly and Midnapur are different from the Ganga alluvium which covers parts of the North Bengal Plain and the whole of the remaining West Bengal Delta excluding the coastal strips in 24-Parganas and Midnapur. In the former alluvial group the riverine tracts of the Damodar and the Kasai have alternating sand beds and immature and irregular stratification and hence ill-developed profiles. The soils are neutral (pH 6.5—7.2) and relatively poor in plant nutrients and organic matter. Relatively greater leaching of clay, mottling, etc., characterise the flat land soils of the tract. These are mildly acidic in reaction (pH 5.8—6.8). Relatively mature profile and higher leaching have affected the uplands of the tract, leading thereby to acidity (pH 5.8—6.9) and deficiency of organic matter.

The Ganga alluvium is, however, rich in plant nutrients and organic matter and is alkaline in reaction (pH 7.0—8.2), though the uplands, i.e., the older alluvium is somewhat neutral in reaction. The riverine tracts are prone to frequent siltation which mars the proper development of profiles. The greyish colour owes to the existence of fine sands. The interfluvial zones are covered by soils, clayey to sandy in texture, depending on the location. With the altitude or the distance from the flood plain, the process of concretion accelerates, and profile developments are also fair.

The coastal soils are the outcome of the interaction of rivers and tides and have developed in the districts of 24-Parganas and Midnapur. The soils are saline and alkaline and contain deposits rich in Ca, Mg, and half-decomposed organic matter.

Ground Water

The region is endowed with ample ground water resources but their occurrence varies seasonally

as well spatially. The porous sandy soils of the riverain areas and the *Duars* allow the water table to go as low as 30 m¹⁰ during summers, especially in northern tract, while in the coastal tract, the lower Hooghly-Rupnarain basins and the Barind tract, it remains within 7 m from the surface. The depth also increases from east to west (>4 m—<13 m) south of the Padma; in the north it increases northward.

During rainy season, water table rises up to the surface in most of the areas, notably the Sunderban region, the Lower Hooghly-Rupnarain basin and the Barind tract. Elsewhere also, it remains within 3 m. The condition of water table has led to the prevalence of surface and gravity irrigation-cum-surface types of water management.

There is possibility of richer sources of confined aquifers which may be tapped through deep boreholes. With precise assessment and utilization of such waters, in future, seasonal water deficiencies may be made up.

Minerals

Mineral deposits are concurrent with the older formations of the *Duars* in the north and *Rarb* in the west, the latter being more important. Raniganj coalfields of national importance lie within this region. The adjoining ore deposits of iron, copper, lead, zinc etc., and their early exploitation, owing to the relative accessibility with respect to Calcutta, led to the initiation of large scale mineral-based industries around Asansol near which a more sophisticated Durgapur complex has now been developed. It is notable that the region produced minerals worth about 500 million rupees (1966) accounting for about 20% of the national mineral production.

Coal is by far the most important mineral as source of power and raw material. The region is credited as the birth place of Indian coal industry (near Sitarampur, 1820) and the Raniganj coal fields are still the second largest in the country. The formations are confined to the Gondwanas lying within the districts of Birbhum, Burdwan and Bankura and continue even beyond into the Chotanagpur Highlands. The coal seams have been classified into (i) the low volatile Barakar (lower) series and (ii) the 'high volatile' Raniganj

(Upper) series. The high grade Raniganj coal is best suited for metallurgical purposes, locomotives and cement works. The copper mines use Raniganj coal as pulverised fuel.

The estimated reserves of coking coal are 288 million tons up to 300 m depth and about 548 million tons up to 600 m.¹¹ The non-coking coal of superior quality is estimated at nearly 2,759 and 4,838 million tons for the corresponding depths. In addition, there is a huge reserve of inferior quality coal in the region.

Iron ores occur in four series : (1) banded haematite quartzites containing good quality ore in Buxa (the *Duars*), (2) Clay limestone of iron stone shales, (3) lateritic ores of the eastern Raniganj coal fields and (4) magnetite patches of Archaean metamorphic rocks. Traces of iron smelting works by Agarias in the early historic period are found in Raniganj coalfield region and prior to the knowledge of the Singhbhum deposits of Bihar, Raniganj iron ores were considered as the main source for large-scale smelting plants in the country. But now these lateritic deposits are used mainly for building and road-making purposes.

Other minerals of importance are copper near Buxa in the *Duars*, plastic fire clay in Barakar Measures, mined near Gourangdi, Barakar, Suri etc.; sulphide minerals, wolfram, ilmenite, iron-manganese, mica etc., scattered in Bankura and Midnapur districts. Dolomite and limestone are found in the *Duars*. Radioactive minerals occur in Madhabpur and Tilaboni areas of Bankura district. Along the border of the Purulia district are found graphite and sillimanite. There are also expectations of mineral oil in the Tertiaries underlying the alluvial cover.

Natural Vegetation

Natural vegetation of the Lower Ganga Plain can be grouped into several classes according to distribution, growth and expanse (about 9,00,000 hectares). The mangrove and tidal forests in the Sunderbans and humid tropical forests in the extreme north of the region are the only preserves of natural vegetation while the western fringe is covered by tropical deciduous forests mostly in the induced form.

The tropical evergreen forests (167,000 hectares) are concentrated in *Duar* region. Deciduous and scrub vegetation covers greater part (299,000 hectares) of the western regions of the Lower Ganga Plain in Midnapur, Bankura, Burdwan and Birbhum. Scattered and isolated patches are also visible in Howrah and Hooghly districts of the Delta Proper. In the tropical evergreen forest the natural vegetation comprises of *gurjun*; the tropical moist deciduous forests comprise of *sal*, and tropical dry deciduous forests, teak, *shisham*, bamboo, etc. The tropical moist forest includes casuarina and mangrove in this region covering about 400,000 hectares.

Physical Resource Base

The Lower Ganga Plain is endowed with vast stretch of flat lands of fertile soil whose fertility is often revived through frequent siltations and which naturally becomes the most potent resource of the region. The soils in association with climate and surface features have contributed to the development of an agricultural landscape dominated by rice-jute culture. The *bils* and ox-bows, numerous in this humid region, resulting from the frequent changes in the stream courses, provide water fronts for settlements as well as one of the chief sources of fishes forming common diet of the people. The physiographic diversity from sea to snow is itself a resource to attract tourists from Digha beach to Darjeeling. The perennial rivers, apart from supplementing the diet of the people through fish catches, are potential resources for irrigation. Great potentials of the Tista are yet to be harnessed for providing irrigation in the *Duars* and *Barind* tract. The potential sources of cheap energy are the rivers and the tides; the latter also facilitating the movement of water-borne traffic since ancient times. The proximity to the Bay provides maritime connection with the outside world. In addition, the Bay is also important for marine fishery.

The *sundari* trees (Sundarbans) provide base for the indigenous woodworks as well as large scale forest-based industries including paper mills. In addition to enhancing the scenic view of the natural landscape, they provide ground for the preservation of wild life in the region. The

huge reserves of basic industrial minerals, i.e., coal and iron, form significant resource base which has stimulated the development of large scale industries amidst vast agricultural lands.

The Cultural Setting

In this region of broad homogeneity, cultural elements, i.e., population, economy, transport systems, etc., are paradoxically complex. Densely populated Hooghly basin and the sparsely populated *Duars*, almost wholly rural district of Malda (95.8%) and totally urban Calcutta (100%), immensely agrarian economy of North Bengal districts and the highly non-agricultural (industrial-commercial) economy of the Hooghly-side, all stand juxtaposed in the region and make its position much more distinct among all such meso regions in the country.

Population

The region accommodating over 33.5 million people in about 81,000 km² area is rather most densely populated among all the 28 regions of the country (density 414 persons/km²), but the distributional unevenness is well-marked at the sub-regional level. Majority of population (about 60%) is concentrated within the Delta Proper having only two-fifths of area, whereas the two other units—the Rarh Plain and the North Bengal Plain accommodate only about 26% and 16% of region's population with more than 1/3rd and 1/4th of area respectively (Fig. 6.6). The gap widens more when still lower order areas are considered as Jalpaiguri district with about 7.5% of area shares only about 4% of population whereas, leaving aside the purely urban Calcutta district, Howrah district supports more than 6% of the region's population with less than 2% of area.

The density varies from 260 persons per km² in North Bengal Plain to above 600 in the Delta Proper. Among the districts (or parts of the districts wherever included in the region) it is as low as 216 (Siliguri subdivision) and rises to 1,372 (Howrah) and 28,256 (Calcutta). With the exception of Malda (329) and Cooch Behar (306), all the districts of North Bengal Plain show densities of less than 250. In the Rarh Plain, the population density is below 400 except in Burd-

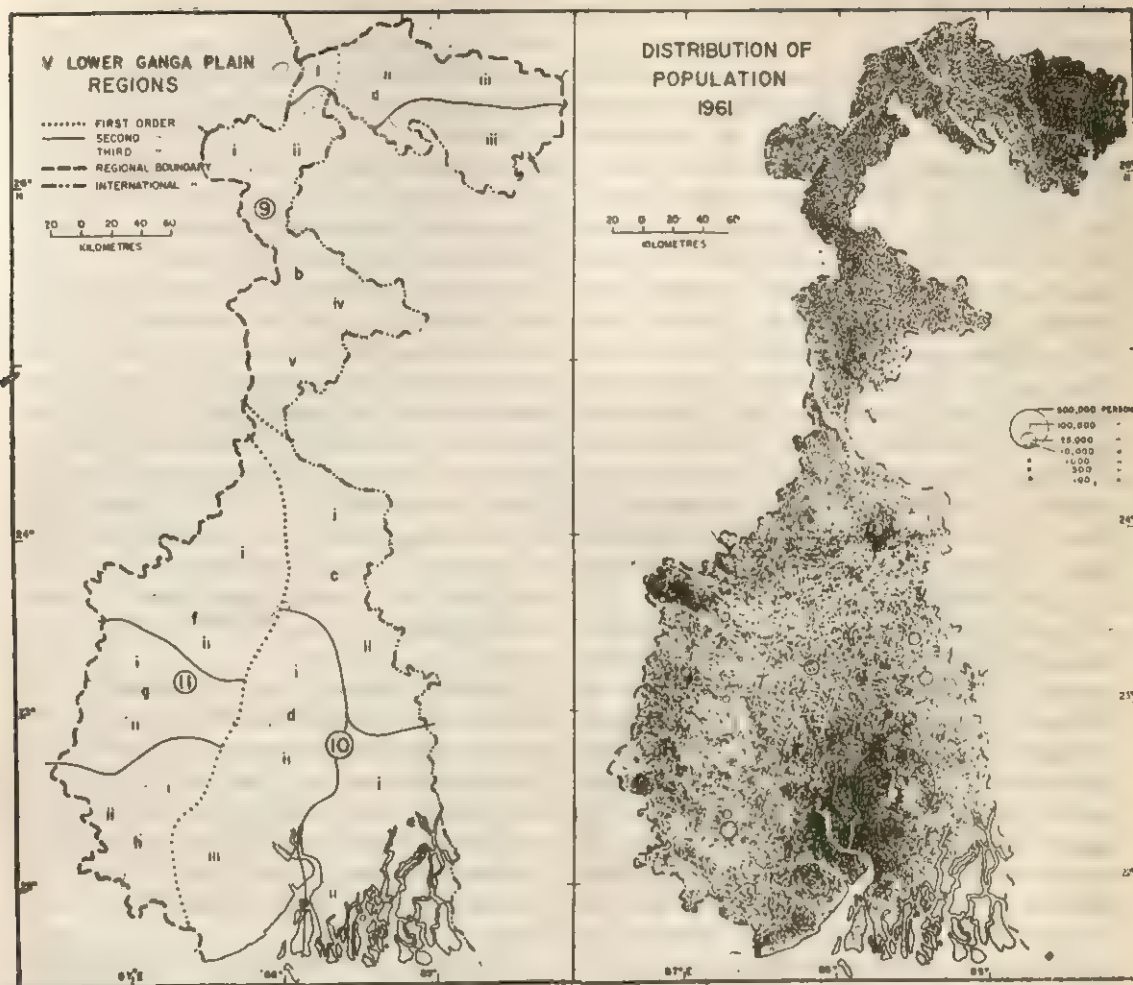


Fig. 6.6

wan (438) with wide variations at district level (Bankura 242; Birbhum 318; and Midnapur 319). The most diverse population density is to be observed in the thickly populated Delta Proper, where the three districts (Murshidabad, Nadia and 24-Parganas) range between 400 and 500, rising up to 709 in Hooghly, 1,372 in Howrah and 28,256 in Calcutta which is highly urbanized. Within the density zone of 200-300/km² which covers about 26% of the area, mostly lying in North Bengal Plain, only one-seventh (14.8%) of population is accommodated, while the same population has only 2% of area of Howrah-Calcutta.

Nearly one-fourth of the population is in the range of 300-400 (area 31.2%) covering North Bengal Plain and Rarh Plain; while the medium density zone (400-500) accounts for 37% of area and 40% of population, mostly constituting the parts of the Delta Proper and Burdwan district.

While rural density increased from 180 per km² (1901) to over 400 (1961), the urban density shot up to over 5,000/km² from about 1,800 during the same period. Urban population density varies from 2,766 (Nadia) to over 28,000 (Calcutta). Howrah ranks first in rural density (908) followed by Hooghly (546), Murshidabad (396) etc.,

being the lowest in Siliguri and Jalpaiguri (about 200).

Though the human occupancy in the region, like other parts, started with rural agglomerations based on agriculture, the region has at present (1961) a significant proportion of urban population (25%) which has increased rather steadily since 1901 (12%). Among the regions it ranks high in urban population. This trend owes to the opportunities providing non-agricultural employment in the urban centres which, apart from offering more assured earning, had the added attraction of safety from natural hazards like floods, etc. Numerically, the urban population registered more than threefold increase between 1901-61. It may also be noted that the increase in urban population has been more than that in the rural population as the ratio of the indices of urban to rural population is 2.33 (1961 over 1901) as against country's ratio of 1.68.

The spatial distribution of rural and urban population varies regionally and presents a greater contrast if analysed by smaller units. The areas of sparse population carry greater rural population and vice-versa. The North Bengal Plain districts have together only 7.9% of its population as urban, accounting for only 5.23% of the region's urban total. The Rarh Plain also has a lower urban population (10.6%) accounting for 13.33% of the region's urban population; the share has been increased owing to the growth of the mining-industrial complex of Asansol-Durgapur. Thus, over four-fifths of urban population (81.47%) is concentrated in the Delta Proper where about 40% of the population is urban. Amongst the districts, Calcutta ranks first with 100% urban population, followed by Howrah (40.5), 24-Parganas (31.8), Hooghly (25.9%), Nadia (18.4), Burdwan (18.2) etc., the lowest being that of Malda (4.2%). Calcutta alone supports about 35% of the region's urban population, 24-Parganas ranking second (about 24%), followed by Howrah (9.8), Hooghly (7.1), Burdwan (6.7). There are two major areas of urban concentration : the industrial and commercial Hooghly-side (the Calcutta conurbation) and industrial-cum-mining Asansol-

Durgapur complex. The polarisation of urban population has progressed so much that the conurbation alone accommodates about four-fifths of the region's urban population, a feature hardly to be observed in any other region except the Punjab Plains where the metropolitan Delhi tends to show similar trend. The primate cities like Bombay and Madras fail to attain this stature in their respective regions. On the district level, however, the significance of Calcutta is declining due to want of space to accommodate more population. Eventually, a host of new independent satellites have emerged in the adjoining districts around it. Though by 1961, Calcutta has more than trebled its population of 1901, its share in the region's urban population has gone down from about 48% (1901) to nearly 35% (1961). The spread of the conurbation outside the district limit and emergence of new urban complexes like Asansol-Durgapur and Midnapur-Kharagpur are mainly contributing to this trend.

The rural population constitutes about three-fourths of the total with an uneven spatial distribution. It shares as much as 92% in North Bengal Plain where agriculture still dominates the economy. Similarly, the western districts of the Rarh Plain record about 90% as rural. Owing to relatively large size and high rural density, the Delta Proper accounts for 42% of the rural population of the region.

The age structure and sex ratio are also unbalanced in the region. As much as 40.92% of population is below 15 years of age while 51.80% belongs to the working age group (15-54). Remaining (7.28%) population is of higher age group (55 years and more). Children of less than a year constitute 2.5%.

In the age group of less than 5 years the sex ratio is 1,025 although the female population on the whole accounts only for 46.7% of the total population with the ratio of 876. The girls (below 14) account for about 43% of the female population while the females in the working age group (15-54) are about 50% as against the corresponding percentages of the males (39 and about 54). The sex ratio of working age group stands

at 808, showing a disparity attributable to the larger number of males from the adjoining regions seeking employment in industries, commerce, services, etc.

The unevenness of the age structure and the sex ratios is more striking in the urban population than in the rural. Out of the total rural population (more than 25 millions) the two age groups (0-14 and 15-54) account for about 43% and 50% while the same in the urban population stand at about 35% and 58% respectively which is indicative of the townward movement of the population of working group from the surrounding areas. The sex ratio, which is 943 for the rural population, is only 706 in the urban population; i.e., much below the regional ratio (876), all the three being lower than the country's ratios of 963, 841 and 941 respectively. The ratio is acute (824) in the age group of 35-54 in rural areas while it is more precarious in urban areas (510) where even the 15-34 age group shows a lower ratio (619). The inter-regional movement of the male youths to the industrial, commercial and service complexes of the region has reduced the ratio in the urban population, while the possible cause in the rural areas is the outside labour engaged in the plantations.

The spatial distribution of the sex ratio (1961) has a direct relation with urbanisation, only exceptions, though of opposite nature, are the Jalpaiguri and Hooghly districts. Although the whole of the region shows a lower ratio (612-974), a continuous zone of lower than the region's average ratio (876) is formed by the districts of Calcutta, 24-Parganas and Howrah. The two detached blocks are formed by Burdwan in the west and Siliguri and Jalpaiguri in the north. Jalpaiguri, though a rural district (rural population over 90%), owes probably to the plantation labourers mostly from the adjoining Middle Ganga Plain and the dominance of transport services. The Hooghly district with 26% urban population is an exception. The two zones comprising (i) Malda, Murshidabad, Birbhum and Nadia and (ii) Bankura and Midnapur, mostly rural in character, have ratios higher than the national average (941). Calcutta, with entirely urban

population, most of which (about 53%) is born outside the city, shows the lowest ratio (612). The sex ratio in general has deteriorated from 945 (1901) to 876 (1961).

The rural sex ratio is somewhat uniform varying between 863 and 987. Even in the more urbanised districts like Howrah, the ratio (940) is quite nearer the regional ratio (943). Only the two plantation districts, Jalpaiguri and Cooch Behar and the mining district of Burdwan have ratios below 900. Elsewhere the rural districts have better ratios. Contrary to it, the urban population shows a wider range—612 (Calcutta) to 933 (Nadia) showing correlation with the urban population. The diversity bears its relation with the nature of the non-agricultural occupations. Nadia, the only exception with 18% of urban population, has preponderance of service towns with 45% of its working population engaged in household and 'other services', requiring somewhat family establishments. Even other districts like Murshidabad, Bankura etc., though predominantly rural, testify this aspect with ratios of 920, 905, etc., and percentage of urban working force engaged in the above occupations being about 48 and 47 respectively. The lower ratios go with the predominance of manufacturing, trade-commerce and transport etc.; as in Calcutta the three groups employ about 61% of the working urban population while the household and services account for about 36%. No doubt, this administrative-cum-commercial complex has a significant proportion of persons (about 35%) engaged in 'other services' alone.

Occupational structure mirrors substantially the regional variation in economy. The region has rather the highest proportion of non-workers (over 67%) amongst all the regions of the country, although it has about 52% of its population within the working age group. The proportion of workers (32.1%) falls much below the national figure (43%). The picture is more dismal in case of females of which only about 8.0% (1.23 million) account for 11.3% of the region's workers as against the country's proportion of 28%. Even the proportion of male workers (54%) is lower than the national average (57%).

Regional variations in respect of the distribution of total working force, urban workers, female workers, etc., is well, marked. The proportion of workers to the total population varies from 27.1% (Nadia) to 42.5% (Siliguri). All the North Bengal districts and subdivisions except Cooch Behar (32%) have higher proportion of workers than the regional average (32.1%). The lower urbanization has naturally reduced the proportion of urban workers to the total workers (below 8%) except in Siliguri (37.6%). Similarly, the districts of the Rarh Plain also show employment proportion more than the average except in Birbhum (31.2). The Delta Proper has lower employment figures except in Calcutta (40.5%) and Hooghly (44.1%). Higher population density and lack of technical and skilled labour might have contributed to the lower proportion of workers in the Delta Proper.

In spite of considerable urbanization, agriculture still contributes substantially to employment (52.6% of the total working force including cultivators 36.87% and agricultural labourers 15.7%). The mining, plantation, etc. (4.61%) raise the proportion of primary sector employment to 57.2%. Tertiary occupations, accommodating 25.10% of workers (including other services 13.83%, trade and commerce 7.85% and transport, storage etc., 3.45%) constitute the second important group. Secondary occupation group stands third with 17.7% (including manufacturing 12%, household industry 4.35% and construction 1.36%). The regional disparity in terms of dominance of occupational types, either individually or by groups, is also noteworthy. Tertiary occupations show less marked variation; for instance, the district-level range lies between 11.8% in Bankura and 24.7% in Nadia except in commercial and administrative core districts of the Calcutta conurbation (Calcutta 69.6%, Howrah 33.1%). The secondary occupations have more pronounced regional significance than the tertiary group. The above or near the average (17.7%) employment is found in the districts of the Delta Proper and Burdwan. The predominantly rural North Bengal Plain (5%) and the Rarh Plain (10%) exhibit low proportion

of employment in secondary sector, the only exception being Malda (15.1%) where silk weaving and spinning are household industries. Even Murshidabad, with dominance of rural population has significant proportion of its population (10%) engaged in household industries. 24 Parganas, Calcutta, Howrah and Hooghly are the districts with significant population engaged in manufacturing (21, 25.2, 36 and 20% respectively). The above four districts along with Burdwan account for 89% of the total persons engaged in manufacturing. Primary sector, providing employment to 57.1% (ranging from 0.4 in Calcutta, 25.6% in Howrah to 83.4% in W. Dinajpur), is more characteristic of the rural North Bengal Plain and the Rarh Plain, where, except Malda in the former and Burdwan in the latter, all other districts have over 70% employment in this sector. 37% of the region's labour force is engaged in cultivation and 16% as labourers. The uneven proportion of the labourers indicates the predominance of landless persons especially in West Dinajpur, Murshidabad, Birbhum, Bankura, Midnapur and Kishanganj, where more than 20% workers are employed as labourers.

The region with less than 3% of area, about 8% of population and 6.15% of the working population of the country stands significantly in manufacturing, trade-commerce, mining, and plantation etc., accounting for 17.4, 11.4 and 11.14% of country's working population in respective categories. Being the core region, Calcutta still justifies its position as the commercial capital of India.

General literacy rate (29%) in so urbanised a region is not very appreciable but appears somewhat satisfactory as compared to the national average of 23.7%. It recorded an increase of only 21.5% during 1951-61, whereas during the same period the country gained by 43%. The spatial variation corresponds with the degree of urbanisation; Calcutta (64.98) shows the highest ratio, followed by the adjoining districts of Howrah (42.93), Hooghly (40.82), Burdwan (34.8) and Nadia (32.54%). The dominantly rural districts of North-Bengal Plain and of the

Delta Proper have lower percentage such as Malda (16.63), Murshidabad (19.4), West Dinajpur (20.66) and Jalpaiguri (23.21).

Scheduled castes and tribes account for about 19 and 5% of total population as against India's 15 and 7% respectively. Their proportion is higher in the northern and western districts with Jalpaiguri (32 and 27%) and Cooch Behar (47 and 13%) in the north and Birbhum (29% and below 1) and Burdwan (14 and 6%) in the west. The proportion decreases in the Padma-Bhagirathi Fork.

The region has almost doubled its population during 1901-61 with an uneven decennial growth rate (-2.9% in 1911-21 to over 32% in 1951-61). The two World Wars and the Partition, in association with epidemics, droughts etc., are partly responsible for irregular growth trends. The region could not escape the countrywide decline during 1911-21 when its population decreased by about 3%. The post-World War I period (1921-31) marked by the worldwide depression, epidemics etc., restricted the growth to only 8.14%. Somewhat accelerated growth (22.93%) during 1931-41 was followed by a mild set back due to World War II and the Partition during 1941-51 (13.22%) which resulted in the mass evacuation of certain areas. The mass refugee influx and rapid industrialisation again accelerated the growth (32.94%) in 1951-61, thus registering the highest decennial growth next only to Assam valley, though the absolute number (about 10 million) was the highest among the regions.

Spatially the overall growth (1901-1961) had been spectacular (over 200%) in Calcutta which now seems to be saturated (1951-61 growth 8.48%). The relatively urbanised and industrial districts of the Delta Proper and Rach Plain along with Jalpaiguri and Malda have registered high growth (100-200%). All these districts except Burdwan and Hooghly, recorded increase in population even during the decade of general decline. Maximum decennial increase was recorded throughout the region during 1951-61; Nadia exhibited the maximum (49.65%), followed by Jalpaiguri (48.27%), 24-Parganas (40.84%) etc., while the minimum (26.17%) was recorded in Bankura.

The regional growth of urban and rural population had been almost uniform (36 and 32% respectively) though with significant intra-regional variations. The rural population growth ranged between 53% (Cooch Behar) and 11% (Howrah) while the urban increase had been between 136% (W. Dinajpur) and 8.48% (Calcutta). The high urban growth in W. Dinajpur might owe to the Partition and transfer of administrative activities of the district. Other districts of relatively higher urban growth are the plantation district of Jalpaiguri (87%) and the mining and industrial districts of Burdwan (73%), 24-Parganas (64) etc.

With the present pace of industrialisation and consequent high increase, there is every fear of economic imbalance in this region where population density per 100 hectare of land under cereals has become as high as 655 showing an increase of 28.2% over 1951. The national figures for the same stand at 388 and 6.9 respectively. This reflects the unbalanced increase in the area under foodgrains or rather negative trend as the population during the period increased by 32%. Even at this growth rate the region may experience a shortage of 1.36 million¹² tons of foodgrain at the consumption rate of 19.5 ounces per head per day. The state of affairs already takes into account the increase in the production as 3.3%. Against the total expected production of 6.1 million tons, the shortage may, however, be reduced to 0.15 million ton by restricting the cereal consumption to 16 oz and the region may have a surplus of 0.75 million ton when consumption rate is reduced to 14 oz.

The growth and distribution of population in the Lower Ganga Plain is as much the consequence of its natural high increase and diversified economic base as of the inter-regional and intra-regional movements of population. The appreciably high increase in urban population (over 200%) during 1901-61 has also its explanation in the cityward march of the rural dwellers, even from within the State; compelled by the high pressure over agricultural land, they 'float' to the nearby cities.

In the region there is dominance of immigrants from other regions, especially the adjoining ones.

In Hooghly 19% of the townward moving rural folk come from within the district. Proportion of inter-district movement ranges from 7.11% in Siliguri to 34% in Nadia.

Settlement

Since the historical period, settlements as occupance units have dominated the cultural landscape. The hamlets of the Munda-Speaking *Adibasis* (Kols etc.) speak of the human occupance of the *Rarh* country even prior to the eastward march of the Aryans who followed the Ganga. The introduction of rice culture, irrigation and village council of the five along with the entire system of agrarian economy and rural settlements are all attributed to the Mundas, a great prehistoric people of the Ganga Valley. Water channels in the *Rarh* area were probably the most favoured sites. The Dravidians "were the original inhabitants of Vanga". The Aryanisation of the Lower Ganga Plain was possibly completed before the sixth century B. C. The fear of attacks by the invaders and wild animals led to the growth of nucleated and closely packed habitations. In addition to small rural hamlets, there developed a few large settlements as centres of administration, pilgrimage, trade, commerce, etc., at suitable sites, mainly along the rivers.

The chief attracting forces for settlements in the region had been the high banks. In addition to the fertile land, the sanctity of the Bhagirathi-water, the then main channel of the Ganga, attracted human settlements. The well-known ancient cities of Tamralipti, Karnaswara and Salagrami, besides others like Varanasi, Allahabad, Patna, of the Middle Ganga Plain, originated on its bank. Other important centres are Aranya (Arambag), Bardhamana (Burdwan), Bhurisresthi (Bhursut), Bishnupur, Mahananda, Nabadwip, Rajnagar, Vetadda (Belore) etc. But the shifting of the main channel to the east resulted in the decline of its importance as a habitable place for sometime. Murshidabad, an early medieval town, situated in the heart of this area on the right bank of the Bhagirathi, is a fine example of decayed town. Bishnupur and Nabadwip are equally important for their past glory as ancient seats of culture.

The Lower Hooghly basin again became the main focus of human habitation as is evidenced by the well-known 15th and 16th century towns of Ghosuri, Salkia, Belur, Chitpur, Kalighat etc., which are now parts of the Calcutta—Howrah complex.

Rural settlements were primarily associated with the soil, and the land was earlier classified as *Uastu* (settled raised grounds), *Kshettra* (cultivated lands), *Gochara* (the pasture lands) etc. Roads, embankments, tanks, temples etc., occupied a considerable portion of the village.

The region has now over 37,000 agglomerations of all sizes (ranging from 200 to over 2.5 million) out of which 177 are classified as urban. Within this long span various factors such as cultural, physical, political, etc., have mustered their influence from time to time, resulting in the regional differentiations in the distributional patterns of the settlements. Analysis of the evolution of settlements reveals the relative insignificance of the present thickly populated Delta Proper or more specifically the Active Delta. The monopolistic agricultural economy since long could not compete with the Delta, where economic base has undergone significant change through commerce and industry.

Rural Settlement

The rural settlements generally consist of small groups of houses, dotting the paddy and jute fields. The average rural population per village is about 700 though there is wide regional variation. The Delta Proper consists of over 40% of the rural population of the region, distributed in 9,800 villages thus showing 35 villages per 100 km² of area and 1,100 persons per village. On the other extreme the western districts (Birbhum, Burdwan, Bankura and Midnapur) have smaller size villages (about 19,000) with 60 per 100 km² and accommodate only 38% of the rural population of the region thus giving about 500 persons per village. The North Bengal Plain has an intermediate position with 736 persons per village and having 33 villages per 100 km².

The region as a whole has preponderance (58%) of small size (less than 500 persons) rural settlements consisting of less than 20% of its rural

population, while medium to large size villages settlements with about 74% of population (500-4,999), account only for 41% of the (Table 2).

TABLE 2
Showing Size and Population of Rural Settlements

Size	—200	—500	—1000	—2000	—5000	—10,000	Over 10,000
%Settlement	26.61	31.29	22.20	13.62	5.60	0.62	0.06
%Rural population	4.12	15.15	22.98	27.36	23.48	5.67	1.24

The most distinguishing feature of the rural dwelling in the region is its conical roof. With little variations houses are primarily *Kacheba* with thatched roof on mud-walls. *Pucca* houses are very rare. Due to waterlogging, plinth is raised as high as 4 to 6 m. Highly pitched thatched roofs mostly of palmyra or *nipa* leaves are very common in the deltaic region, representing environmental adaptation; while corrugated iron sheets or tins are frequently popular in the *Duars* and the Tista flood plains. Corrugated iron has the merit of being fireproof, but otherwise is obviously far less suited to the climate than thickly thatched roofs. Split bamboo, reed or jute-stalk matting etc., are the common wall materials; mud, rarely the wood and very rarely indeed (except in towns) the brick are used. Floors are of mud, often scrupulously clean. A farmstead in Bengal is not an isolated dwelling of a family like American farmsteads but is always an assemblage of several huts, the size of hut depending on the economic status of the inhabitants. Intermingling of the groves of bamboo, banana and mangoes add to the scenic beauty of the village. Amenities like drainage, sewerage etc., are often absent. Huts up to half a dozen or so cluster around a little court with a tank, often resulting from digging out of the earth for walls, and used for bathing and domestic water supply. The house is a multipurpose apartment with also a cowshed attached. Much of the life of the family is spent in the open air or in the verandah. A great variety of mats and baskets, large storage jars, chests etc., constitute most of the furniture. In areas where the streams are tidal or get overflooded in the rains, nets and other fishing gear are also noticeable.

Caste system has also exercised its influence in village patterning. The upper class communities such as *Brahmins*, *Kayasthas* and *Vaidyas* mostly dominate the village system and often occupy the central portion in the settlement. The scheduled castes such as the *Bagdis* or *Kus Meteys*, the *Bauris*, the *Haris*, the *Namsudras*, the *Muchis* have usually isolated hamlets away from the central site. These service class people supply most of the agricultural labour and predominate in the North Bengal Plain. Each village has several ponds for domestic purposes and fish farming.

Distribution and movement of the principal agriculture castes in this Plain is a noteworthy feature of social and environmental adjustment from the historical period. To them owes the present agricultural landscape. It is all through the successive influx of the new people that these castes have been deprived of their ruling rights. The *Rajbansis* in Cooch Behar-Jalpaiguri, *Mahisyas* in the SW, *Namsudras* in the SE, etc., had their domains but the new people invading this plain pushed them into the low-lying marshy tracts or the forest-clad areas. With them extended the frontiers of cultivation in the Lower Ganga Plain. The *Bagdis* and *Bauris* have taken to coal-mining industry though the former continue to be agriculturists also. The *Mahisyas* are the strongest agricultural caste. The *Pods* and *Namsudras* are also agriculturists and have extended the frontiers of agriculture in the recently reclaimed lands along the Adi Ganga and in the SE respectively. *Mahisyas* are still strong in the rural areas of Midnapur, Howrah, Hooghly and 24 Parganas. *Rajbansis* number next to the *Mahisyas* and *Namsudras*. The high caste Hindus mainly occupied the banks of all the ancient active rivers, while

the agricultural castes lived mainly in the intervening marshes and jungles to the south and south-west, although they were later invited to settle on the outskirts of the villages to supply agricultural labour. They are still numerous in the fertile lower delta. The high caste Hindus, though scattered throughout the region, are represented numerically more in Bankura, Howrah, Burdwan, Birbhum, Midnapur, etc., and less in the northern plain area. The Rarh Plain has the biggest concentration of 'Rarhi' Brahmins.

Ruling high castes, though found in Murshidabad, Birbhum and Nadia also, are the largest in Burdwan, Hooghly and 24-Parganas (ancient *Bardhaman Bhukti*). *Danda Bhuktis* of Bankura and Midnapur which could not be conquered effectively by the Muslims constitute large proportions of high caste Hindus.

Settlement Patterns

There is a well-developed regional variation in the types of settlements. Distribution and siting of rural settlements in the Rarh, west of the Bhagirathi, are distinct from that of the Bagri, east of the Bhagirathi. The former is to a great extent marked by closely clustered settlements

situated about 2 km apart, while the latter is dominated by linear assemblage, but the picture of such settlements is quite different here from elsewhere as most of the villages tend to merge here with each other so that it becomes difficult to recognise their singular entity. Broadly, the rural settlements are : (a) compact, (b) semi-compact or hamleted clusters and (c) linear, emerging as a result of the interplay of both physical and cultural factors.

Linear patterns of settlements are most common along the coastal dunes (Fig. 6.7 A and B), in the Tista Plain and the Delta Proper, along the old beds of rivers and levees or along roads especially around the industrial concentrations. Scattered and sprinkled settlements are noticeable in parts of the Rarh Plain, newly reclaimed Duars and the Sunderbans. The compact and nucleated settlements are most prevalent in the Ajay-Damodar and Ajay-Brahmani interfluves and the Moribund delta. The dry-point waterfronts are natural sites for compact settlements in the Delta Proper; in the Rarh Plain artificial tanks also provide for such settlements (Fig. 6.8).

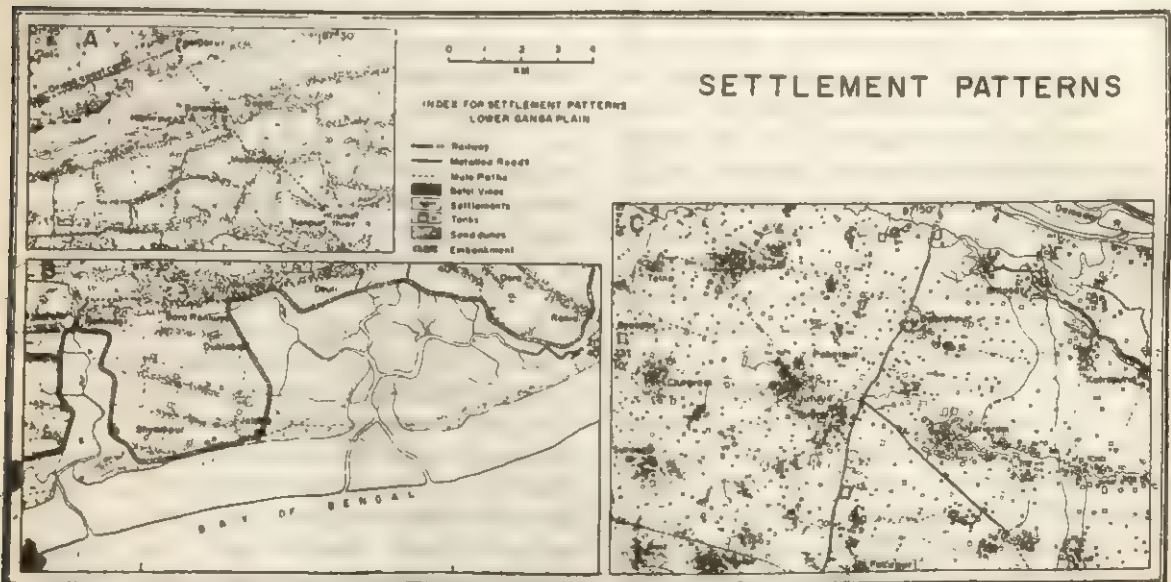


Fig. 6.7 A, B. Linear Pattern along the coast.

C. Nucleation of the Mature Delta and Artificial Tanks.

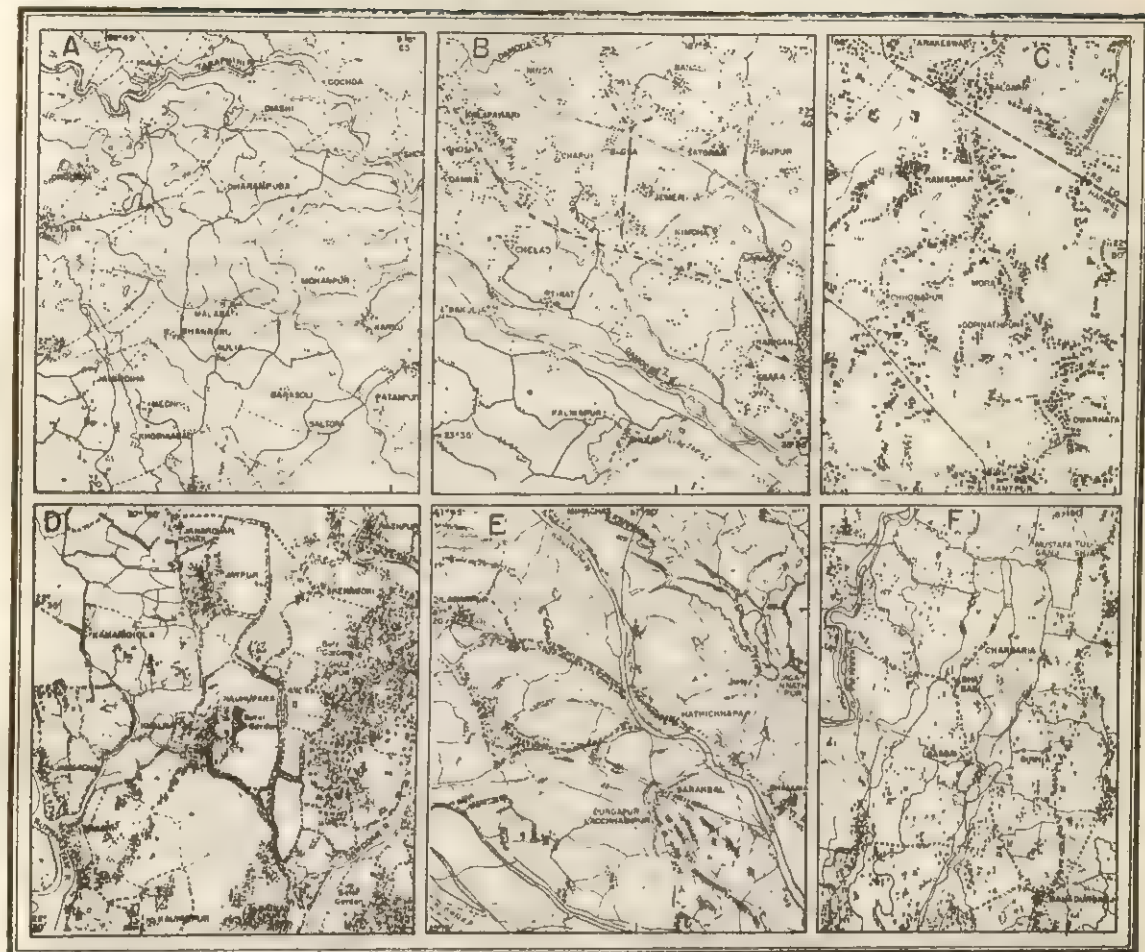


Fig. 6.8 SETTLEMENT PATTERNS : A, Sprinkled, Mining Area. B, Semi-compact, Rarh (Midnapur). C, River-Side lineation. D, Tank-Side Settlements, Betel vines pre-dominate. E, Interfluvial lineation. F, Track-Side Settlements.

Hamleted clusters may be seen in the Bhagirathi-Dwarka interfluvium north of Azimganj-Nalhati Railway line. The undulating nature of ground has interrupted long stretch of arable lands. The low grounds are left for *Aman* paddy whereas high grounds (*Danga*) are occupied by hamlets. In addition, some small groups of scheduled tribes, Santhals and Oraons, prefer to live in a small group near the cultivable land where they are mainly engaged as agricultural labourers.

Settlements of the Rarh¹³

The Rarh exhibits a variety of natural environment. In the Padma riverine tract, settlements have grown up along the high banks of the rivers, which provide cheap transport facilities and drinking water along with fish, a favoured item in diet. An extensive patch of loamy soil which is suitable for *Aus* paddy attracts as a clustering force.

The unattractive sandy *chars* of the Padma as

also of other rivers, which disappear during floods, are completely devoid of human settlements. To the south-west of the Kanloi Nala and around the Belpahari (47 m), some dry-point settlements are noticed. Some fairly compact and big villages are found in close proximity to the seasonally active *Nalas*; Baira, Nayansukh, Khejuria, Tildaga etc., are notable, each with more than two thousand inhabitants (Fig. 6.9).

In the Bhagirathi-Dwarka interfluvium the distribution pattern of rural settlements varies from north to south and from the lateritic west to the alluvial east. The undulating nature of the

ground has contributed to semi-compact villages (Fig. 6.9). Some large villages are also situated, viz. Shekhar Dighi, Mirzapur, Banyeshwar, Morgram, Bokhara, etc., all studded with ponds or tanks. A bluff of 12 m high in the Rangamati locality, running almost parallel to the Bhagirathi, has given rise to linear settlements.

In the Mor-Dwarka-Hijol plain *bils* provide water-fronts for some large and compact settlements. The presence of rich and fertile *Aman* lands in canal areas is responsible for high degree of compactness and evenness of distribution of settlements.

RURAL SETTLEMENT OF RARH

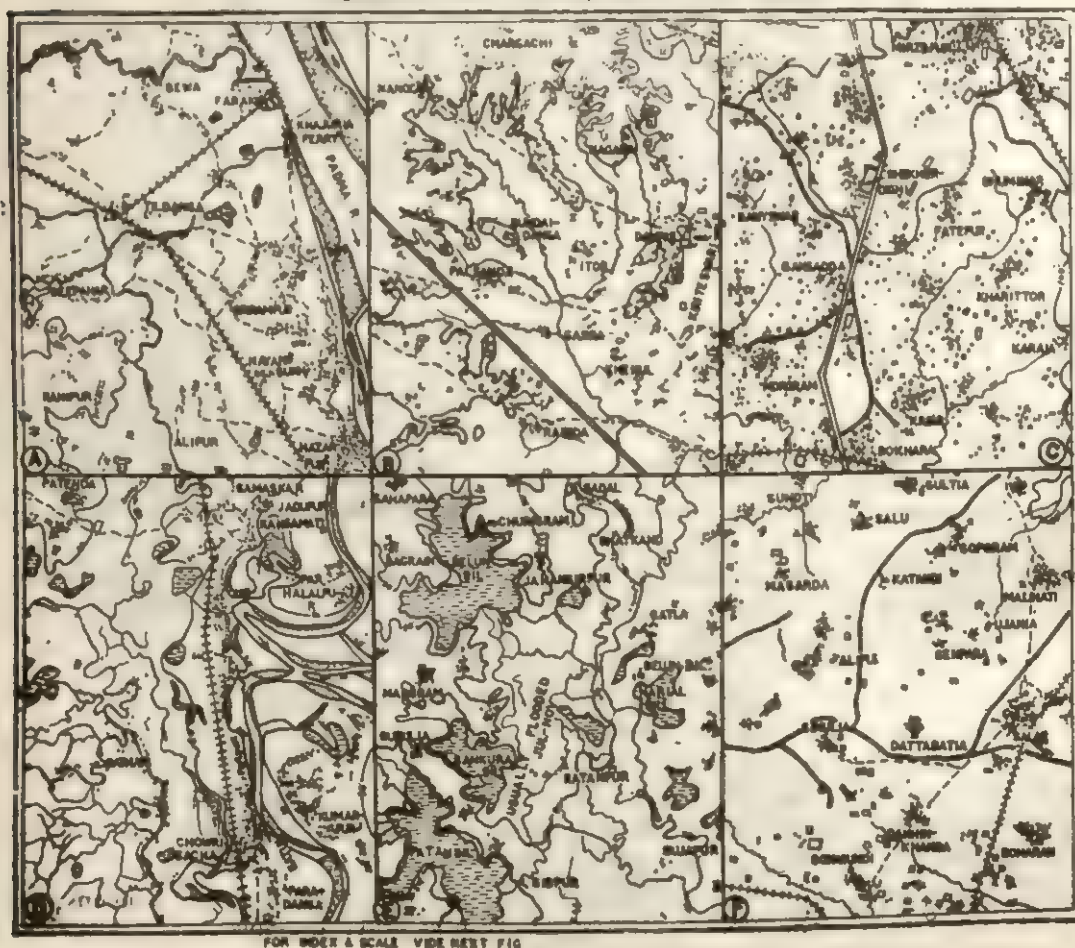


Fig. 6.9

The development of coal mining activities and early consequent transport links (railways and roads) with Calcutta, accelerated the growth of iron and steel industry in Asansol-Raniganj area. It followed the growth of engineering, paper, aluminium and other ancillary industries which together changed the economic landscape of this agricultural tract within a short span of time. It has brought far-reaching changes in the economic and social life of the people here. The settlements sprinkle throughout the adjoining collieries and industrial establishments (Fig.6.8B). Mining has been a mixed blessing to the area by giving employment to a large number of inhabitants in various occupations on the one hand and on the other, the ill-planned mining operations have rendered the land unfit for cultivation even after the mines exhaust. The collapse of the unsupported mines often results in the development of water-logged or marshy tracts. The general lowering of the water table and depletion of soil moisture have accentuated the problem of even drinking water, specially in the villages. It becomes equally difficult for the people to revert back to agriculture, their original occupation.

*Settlements of the Bagri*¹⁴ : The Bagri is a unique area for its remarkable distribution and siting of rural settlements. The role of rivers is quite conspicuous throughout the region and settlements have definitely followed the channels of the Padma and its distributaries.

In the Padma-Bhagirathi tract the concave banks with relative heights between 6 m and 9 m are the favoured sites (Fig.6.10). Only the older or rather stabilised *chars* are being settled. Numerous linear settlements hug the Jalangi levee (Murshidabad) as also in Malda, 24-Parganas, etc.

In the low-lying Kalantar area a few permanent settlements are located on high ground with greater inter-village distance than in other parts of the region.

Strikingly enough, compact settlements are sited usually on the margin of *bils*, such as Salmara, Handa, Harma, etc. that form a continuous chain of water bodies.

*Settlements in Active Delta (Bidyadhari-Peali Region)*¹⁵ : The landscape is marked by numerous

dead or decaying rivers. The areas in the vicinity of the active rivers are being raised whereas others deprived of the annual deposition of silt are being depressed. The higher western portion owes to the past activities of the Hooghly and the Adi Ganga, whereas the eastern part is low-lying though the entire region is composed of estuarine deposits of the Ganga when it emptied in the neighbourhood of Gaud.

The settlements here range in size and function from a simple isolated homestead to a city like Dum Dum. Several types of settlements such as dispersed, agglomerated and linear rural settlements (some being planned ones, particularly refugee settlements) and townships, both planned and unplanned, are observed here.

The rough lands with marshy and water-logged basins and saline soils, having little possibility of agricultural developments without reclamation, have dispersed rural settlements of farmstead type. Seasonal inundation during the monsoons call for raising the plinths of individual farmsteads to secure a dry-point. Sometimes wooden plinths are also made, specially for the huts. In the vicinity of the salt lake region and in low-lying pockets of marshes, this is a common feature.

The tendency towards agglomeration is most marked in the low-lying paddy areas and along the coast where fishing is the most important occupation. Baruipur region with paddy, market gardening, betel vines, orchards along with cottage industries, furnishes a good example of such agglomerations.

Linear clustering of dwellings are found along the river levees, like those in the Bagri tract and in the recently claimed areas of the Sundarbans. Dwellings follow the embankments and the roads upon them.

Port Canning area, an abandoned site (1871) of a port supplementary to Calcutta, stands conspicuously as a planned pocket in the adjoining slum area. It is the sole example of such type and can hardly be treated as representative.

The Bidyadhari-Peali region contains about 15% of the refugee population of 24-Parganas. Often the refugee colonies are planned ones as at Patna-Auliapur, Garia (Sonarpur Thana), Uttar-

RURAL SETTLEMENT OF BAGRI



Fig. 6.10

bag (Baruipur Thana), etc. Out of immediate urgency as many as 35 unplanned colonies grew up in Dum Dum and Rajarhat thanas.

Apart from these rural sites and types, there are old unplanned towns of Baruipur (13,608), Jayanagar-Majilpur (14,177), Dum Dum etc., with surface drains and unsystematic assemblage of buildings. The Block Development Scheme has, however, taken steps to establish planned townships, such as Piali (Fig. 6.11), which will also have small-scale industries for subsidiary employ-

ment to relieve the overgrowing pressure on agricultural lands.

Some Sample Villages

Nabagram¹⁶ (24°10'18" N—88°6'0" E) : a block headquarters in Murshidabad, with a population of 2,084 persons, is located 16 km west of Murshidabad on the Lal Bagh-Panchgram road in Rarh Plain.

The name Nabagram (Naba = New; Gram = village) clearly suggests its recent origin. Prior to 1936, some Chashi Konais (agricultural

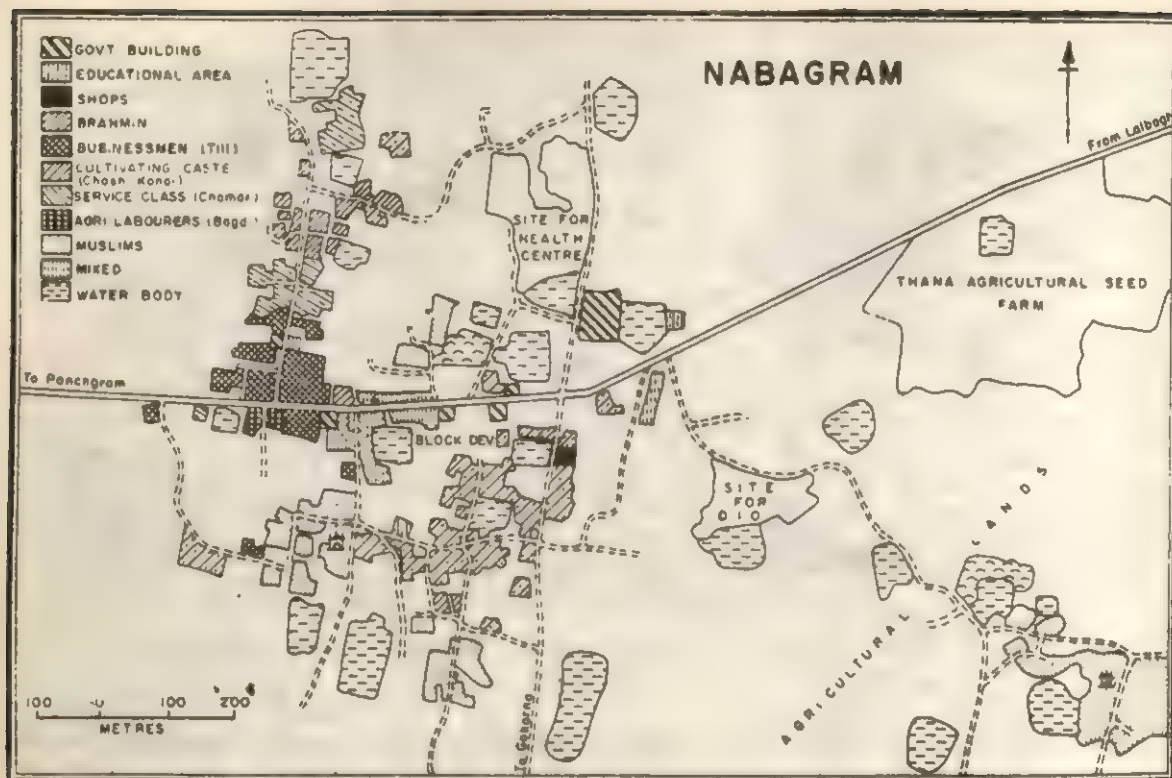


Fig. 6.12 Village Morphology

Kalidaha-station road around the tomb and the mosque. Small pockets of Brahmans, Jains, Banias, etc., are confined to the south of the road which is a cultural divide. The houses are mostly walled, thatched and single storeyed (1,279). There are altogether 104 non-residential establishments accommodating shops, godowns, offices, etc. Its sanitary condition is satisfactory as it has 112 sanitary latrines.

Weekly *batis* (Monday and Tuesday) are held on the eastern bank of the Keramat Sagar (tank). A rice mill is the only industrial establishment. Electric supply, tube-wells, the Block Development, P.W.D. and marketing offices mark the recent developments. In addition, Salar has a high school, a health centre and two temporary cinema houses.

Bagitpur¹⁸ : A Bagri village of medium size (980 persons) lies in Domkal thana and is dominated by *Sakbari* (Conch-shell bangle makers)

population (500). Cossimbazar, the nearest railway station, is 35 km. Berhampur-Jalangi State Highway is the only means of transport. The Sealmari Bund protects the village from seasonal inundation. *Sakhs* probably migrated from Sakharipara of Dacca during early 18th century. Two hamlets of Muslims have developed in the north-west. Different castes and communities occupy the six *Paras* (block) of the village (Fig. 6.13). The co-operative nature of Conch-shell industry has rendered a compact character to this village. In addition, pottery, basket-making, and oil pressing are the other household industries.

Urban Settlements

The towns (176) are mostly over-grown villages with predominance of non-agricultural occupations (over 75%) and they exhibit polarised distribution along the Hooghly-side (95) and around Asansol (13) (Fig. 6.14). Administration, trade and

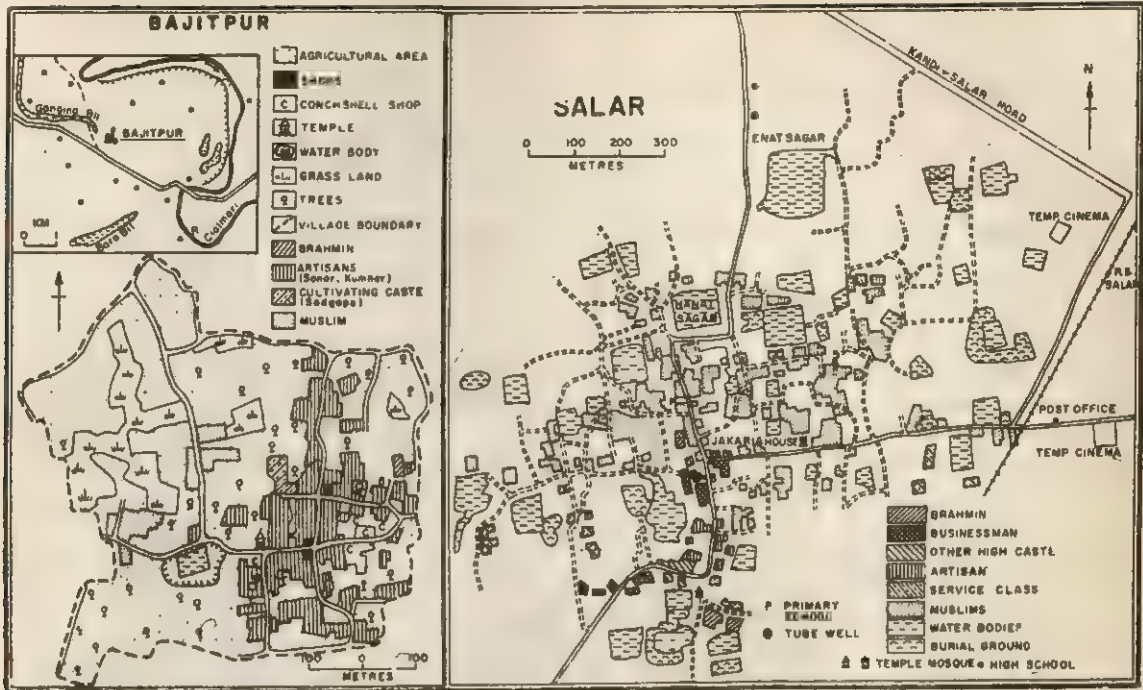


Fig. 6.13 Village Morphology

commerce and industry—all have contributed to the growth and development of urban centres. Religious centres are only a few. Sweeping changes in the distributional and functional patterns, regionally as well as in case of particular towns, owing to changes in the political set up, economic activities, and not the least important, the changing significance of the transport means, weave out the whole story of the urban growth in this region. Even the micro-order topographic prominences in this vast stream-infested land have been sometimes ignored at the cost of the transport facilities, originally the rivers. There can be hardly any parallel to the Hooghly-side as an example of the 'momentum of early start', which since historic past had been the commercial nucleus of not only this region but almost the whole of the Ganga valley. Later, the modern industrial landscape was appended to this basin which was accelerated by the British policy to undermine the handicraft exports, aiming at and succeeding in destroying the indigenous art and craftsmanship

of the country as a whole and this region in particular. By the time the new transport arteries, the railways and modern road-nets, could develop, this river frontage has acquired as much potentiality as to compel these arteries to pass through this urbanized belt, occupying the levees of the oscillating Hooghly channel, along whatever narrow high belts were available. The urban establishments have also partly helped in confining this river.

Apart from these two concentrations, the urban centres, mainly as the administrative headquarters (district, subdivision or thana), dot the agrarian landscape as 'islands' and represent typical Indian urban landscape. The former well-grown Dhulian-Beldanga tract in Murshidabad is now reviving with Berhampur (62,317) as its centre, may be under the impact of the Hooghly-side concentration which is already encroaching now in Nadia District. Kharagpur-Midnapur region forms the only significant concentration in the S.W. which, but for the notorious Damodar and Rup-



narayan, would have developed better along the main line of the S. E. Railway. Contai (22,094) is the only coastal town and Digha may emerge as another in due course with the development of the beach. In the North Bengal Plain, with dominantly agricultural economy, only few towns such as Siliguri (a transport node), Jalpaiguri (a plantation centre), Cooch Behar, English Bazar etc., have developed. Thus the towns in the Rarh and the Duar-Barind tract are few and far apart.

Shantipur, Nabadwip and Krishnanagar are notable centres which developed on trade and communication routes as river ports and transit centres. Many towns have declined due to unfavourable circumstances of competition such as Kashirpai, Ghatal, Ramjibanpur, and Chandrakona in the western margin of the Rarh Plain. On the contrary, many towns like Arambagh (Hooghly), Murshidabad, Baraipur (24-Parganas), Dinhat (Jalpaiguri) and Ondal (Burdwan) gained in importance due to recent development of trade, commerce and transportation activities.

The decline of trade through the Bhagirathi in the lower Ganga Valley due to partition of Bengal has exerted an adverse effect on the economy. Lalga town has been the worst sufferer on this count. Many towns such as Jalpaiguri, Jiaganj and Azimganj have suffered heavy losses due to changing river courses in the North Bengal Plain.

Growth in the number of urban villages is a true indicator of a developing nation. Quite in harmony, the spectacular rise in the number of towns (64) has been registered during 1951-61 with introduction of the phased five-year programmes of development by the National Government. Here again the districts with larger concentrations gained maximum number of towns—Howrah (19) and 24-Parganas (17). Prior to this, there appears to be a slower growth as only 36 new towns were added during 50 years perhaps revealing a natural increase. Since 1951 numerous industrial and transport nodes emerged either by appendage of some non-agricultural services to the over-grown villages which in turn were swallowed by the towns, or the establishment of entirely new planned industrial sites like Durgapur. Class V towns (5000-10,000) gained the maximum

in number (34) as they also registered the highest percentage gain in population (241%) though the numerical gain shares only about 12% of the total increase in urban population since 1951. This class as a whole accounts for 4.5% of the total urban population (1961). Class I towns increased from 7 in 1951 to 12 in 1961, accounting for over 50% of the net gain in the region's urban population, and Calcutta alone, although registering the minimum percentage increase (8.6) in its own population, shares about 20% of the increase in this class, followed by the South-Suburban town group (11%), Howrah, Asansol, Bally, South Dum-Dum etc., being others in order. It is noteworthy that the percentage share of class I towns in the total urban population of the region has recorded a relative decline as their share decreased from 58.7% in 1951 to 56.5% in 1961. Similar decline in percentage share is also observed in Class IV and VI towns.

All other classes have recorded marginal increase in their shares. It clearly reveals the increasing significance of the smaller urban service centres. In addition to the natural population increase, the city-ward movement of population and increased industrial and commercial activities and refugee influx have also contributed significantly to the trends of urban growth and development, particularly in Malda, W. Dinajpur and 24-Parganas.

The site, environment and transport links rather than the size have played important role in determining the functional specialization, particularly of industrial towns as "a town with a population of 51,423 (Halisar) as well as a large city of 5,12,598 (Howrah) could be industrial". Significant overlappings in the size and functional specialisation are observed, specially in class I and II towns.

According to the dominance of one or more functions (based on Nelson's technique), of 142 town groups, 73 are mono-functional classified as industrial (44), service (21), primary activities (5), transport (2), and commercial (1) towns. The second group consists of 37 bi-functional towns with 'services' as more significant occupation employing over 90% of working population

of the group. The remaining (32) are classed as diversified, in which 'service' dominates the scene in 14 towns with about 54% of employment, followed by trade and commerce (7) employing 20% of the workers. On the whole 58 towns reflect industrial specialisation, 55 services, 13 primary activities, 11 trade and commerce and only 5 transport, with some regional associations (Fig. 6.14).

A correlation of maps very well shows a picture of urban regions of various dimensions. The urban regions in the North Bengal Plain have their limited influence; while largest area of influence and high positive growth are the main characteristics of the towns and cities situated in the southern regions. In the Calcutta conurbation particularly, the town and city influence is superbly overlapped by Calcutta. The sphere of influence of towns in the North Bengal Plain is comparatively very weak due to lesser development of resources and underdeveloped economic infra-structure. Siliguri, Jalpaiguri and Cooch Behar control to a great extent the urban functions in the Duar regions. New towns like Kharagpur, Durgapur, Kalyani in the Rarh Plain and Delta region reveal the pattern of transmissional stage of economic development from new centres to the intervening transitional zones.

The growth and emergence of the urban centres, in most cases, being the consequence of successive accrual of non-agricultural activities around a pre-existing agrarian village in an unplanned manner, according to convenience, naturally endowed the settlements with a rather complex morphological character with respect to functions as well as structures. Establishments of diverse functions and structures are common almost in all category of urban settlements. The anglicized developments are all later additions to the towns. The growth pattern, the essential services etc. have greatly been influenced by the political set up along with other environmental conditions. Oscillatory river channels are much greater a menace in influencing the urban spread and activities of different towns of the region; Murshidabad is one of such cases. However, there

exist certain enclaves, exclusively meant for certain functions such as administrative sector, the hospitals, the cantonments etc. Often the main retail shopping centres cling around the central chowks, though, with further expansion several supplementary shopping parades emerge out on other road crossings or lane bifurcation points, the *naka*. Quite naturally the wholesale specialized markets considering traffic congestions, avoid the central retail shopping areas. In the old feudal capitals the retailers used to occupy the road sides, in front of the palaces or forts which are still in certain cases maintaining the pattern, but in most cases they have been pulled by new arteries. Services, like postal, banking etc. were naturally sites within the business sections.

Considerable changes in the functional landscape as well as in the towns spread have crept in, keeping pace with the growing needs and population growth. The old narrow roads have been widened as economically as possible failing which new planned market sites are established or by-passes have been provided. The expansion of the towns is generally ribbon-like along the radiating roads and the river fronts outward from the main built-up area. The planned townships like Kharagpur, Durgapur, Kalyani, Siliguri etc. differ considerably in functional morphology from other towns.

*Functional Landscape of Lower Hooghly Towns*¹⁹ : Lower Hooghly Towns, with Calcutta as the central city constitute one of the biggest conurbations in India. Extending from Bansberia town in the north to Budge Budge in the south, along both the banks of the Hooghly, the urban complex forms the economic backbone of West Bengal.

The present urban centres, all located on the levees of the Hooghly river were originally market centres; in most cases, during the 15th century, when the river formed the main line of transport and communication for the trade and commerce of northern India to the outside world.

The importance of the river attracted European traders who contributed to the initial nucleation of many of these towns viz. Bandel (Portuguese,

early 16th century), Chinsura (Dutch, 1632), Chandernagore (French, 1673 or 1676), Serampore (Danish, 1676), Baranagar (Dutch), Calcutta (English, 1690). Formerly Saptagram, near Bandel and later Hooghly were administrative headquarters of the Moghuls.

The study of the six sample towns viz., Hooghly-Chinsura, Chandernagore, Serampore, Rishra, Konnagar and Bally has been taken up to show the nature of the functional landscapes and on the basis of the study to find out a generalized landuse pattern of the conurbation (Fig. 6.15).

Administrative : Except in Rishra, the administrative areas in all the other five sample towns

are located on the river side, and in Hooghly-Chinsura and Serampore these areas form comparatively bigger zones or districts. The other towns possess only small administrative units. The location of the administrative zones indicates the influence of the early commercial impact and, subsequently, the European settlement and administration : Europeans preferred the river-side as all of them were maritime powers. The European culture, so very different from the Indian, resulted in the contrasting cultural landscapes in these towns and the riverside bore the marked influence of European architecture in the layout of roads, buildings, courtyards etc. Very

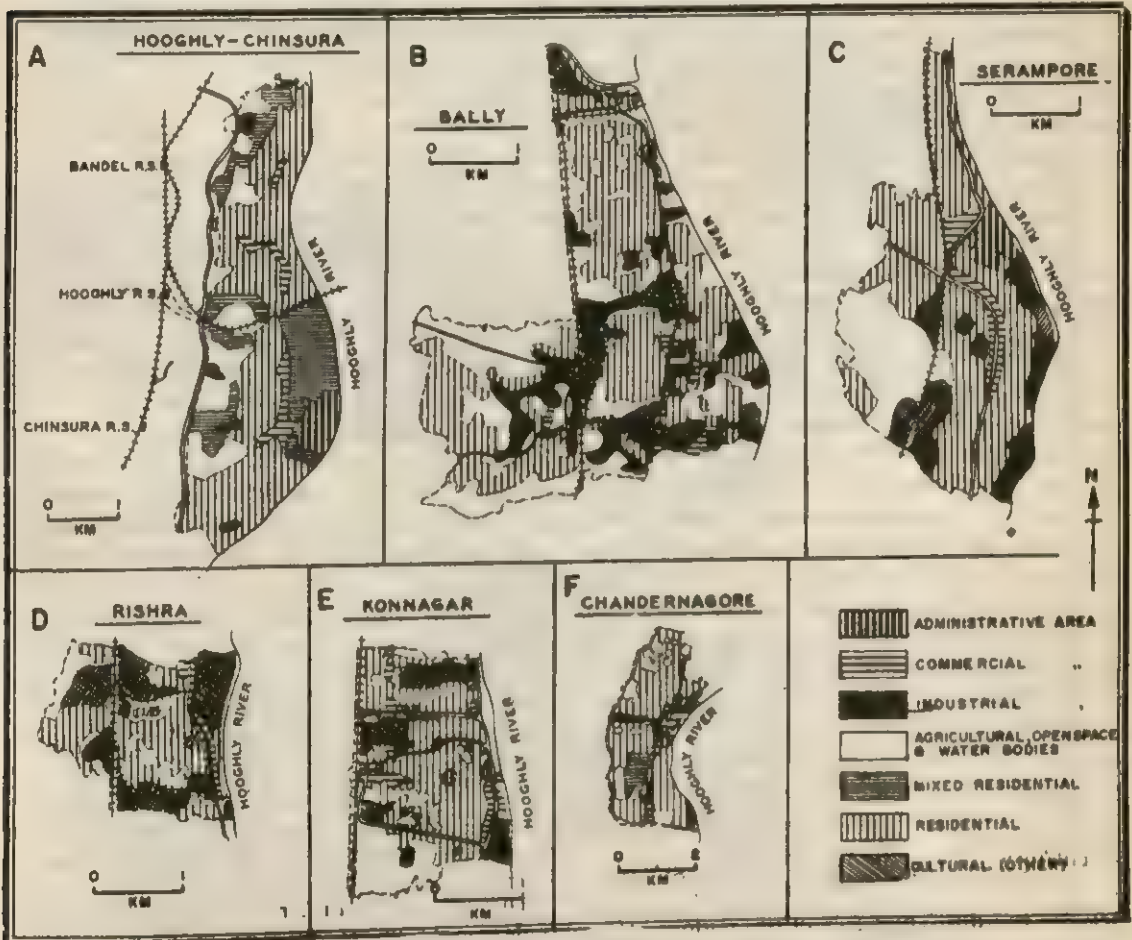


Fig. 6.15 : Lower Hooghly Towns, Functional Landscape.

small administrative areas of Rishra and Konnagar are due to the linkage of both these towns with Serampore of which these were the southernmost appendages. At Bally the same picture is repeated. Before 1883 the Bally town was within the Howrah Municipality and as such the administrative function was performed through the bigger town.

Commercial : In all these towns a ribbon shaped structure of the commercial areas along the Grand Trunk Road, main road link of the conurbation with northern India, is noticed. Formerly, the river was the highway of commerce and the riverside was populated but with the construction of the Grand Trunk road and its subsequent rise in importance because of its link with Calcutta the density of population increased towards the west by the side of the road. As a result, commercial units developed along this important road transport link—the bus service started towards the end of the 3rd decade of the 20th century.

Industrial : From the total use of land it is evident that the industrial function is one of the most important in all the sample towns except Hooghly-Chinsura and Chandernagore, and its importance is convincing, compared to the dominant residential landuse. Hooghly-bank is the favourable site of location because the river is and was the most important means of communication and transport of the factory products from the manufacturing head to the main business centre, Calcutta. With the development of other transport links viz., rail and roads, subsequent development of industries took place further inland with the facilities of the road and rail transport. The industrial encroachments are at the cost of the residential and as the former ensures higher monetary returns the industrial units are penetrating into the residential sectors. This activity is less prominent at Hooghly-Chinsura and Chandernagore which lack the character of industrial nucleation as found in the case of the other towns.

Cultural (other) : Instead of covering a minor portion in the functional landscape of the studied towns, the cultural units, an accumulated function of institutional, religious, recreational etc.,

has intimate relation with the residential landuse and its location is along the road links through the main residential areas. As the units are very small and scattered these are insignificant on the maps.

Residential : The residential function is the most important and it covers a large portion in the functional landscape of the towns : the preponderance of a single zone is marked. The residential areas are quite resistant to the encroachment of industry, commerce etc. But due to the onslaught of the industries and administration the residential areas show a spatial change, i.e., a shift from the riverside further inland. The latest phase resulted in further squeezing of the residential areas in consequence of the development of industry by the side of the railway.

Mixed-Residential : Immediately by the side of the residential areas are the mixed residential areas viz., residential mixed with administrative, industrial and agricultural. Hooghly-Chinsura and Chandernagore only show a marked influence of such mixed zones. In Hooghly-Chinsura the residential section is used for the administrative purposes. The headquarters of the Hooghly district are located here and as such a number of administrative units are functioning which prefer accommodation in the residential zone. The mixed agricultural areas are noticed in all the towns and are marked in Hooghly-Chinsura. Because of the importance of the cottage industry in Chandernagore, residential-cum-industrial areas are prominent in the landuse set up of this town.

Open space : Large areas of open spaces presented by water bodies and low agricultural lands are located in the western margin of the towns. This is due mainly to arbitrary delimitation of the administrative boundary of towns and spreading of urban zones from the earlier settled areas to the marginal sections which are dominantly agricultural. The open spaces in the eastern part of the towns by the side of the river originated due to the shifting of the river bed further east, thus creating lowlying areas away from the residential sections and liable to be inundated during the high tides in rainy season.

Many of the areas are now occupied by the refugee families from East Pakistan.

Thus it may be remarked that the influence of the river and that of Calcutta is marked on the landuse structure of all the towns. The main road and rail link thus run from south to north. The subsidiary road links are latitudinal in many cases, giving rise to rectangular landuse blocks. The location and spatial distribution of the different types of landuse also show the same trend. The industries spoiled the good residential areas by the side of the river and favourable sites for future recreational purposes on the river side have been replaced by ugly industrial structures.

The functional landscape of the towns of

Asansol—Durgapur industrial belt clearly exemplifies the regional characteristics. Naturally the industrial and commercial towns, complementary to each other, have sprung up here. Industrial functions dominate in Asansol (1961 'pop : 103,405), Kulti (34,282), Burnpur (65,284) and Raniganj (30,113). Commerce is less significant except in Raniganj where a business section has also developed. Residential areas (Class I) surround the business area in Raniganj whereas these areas are segregated to the south of the industrial sectors in Asansol, Burnpur and Kulti. Industrial areas occupy continuous blocks in the northern sectors. Administrative sector is not remarkable except in Asansol (Fig. 6.16).

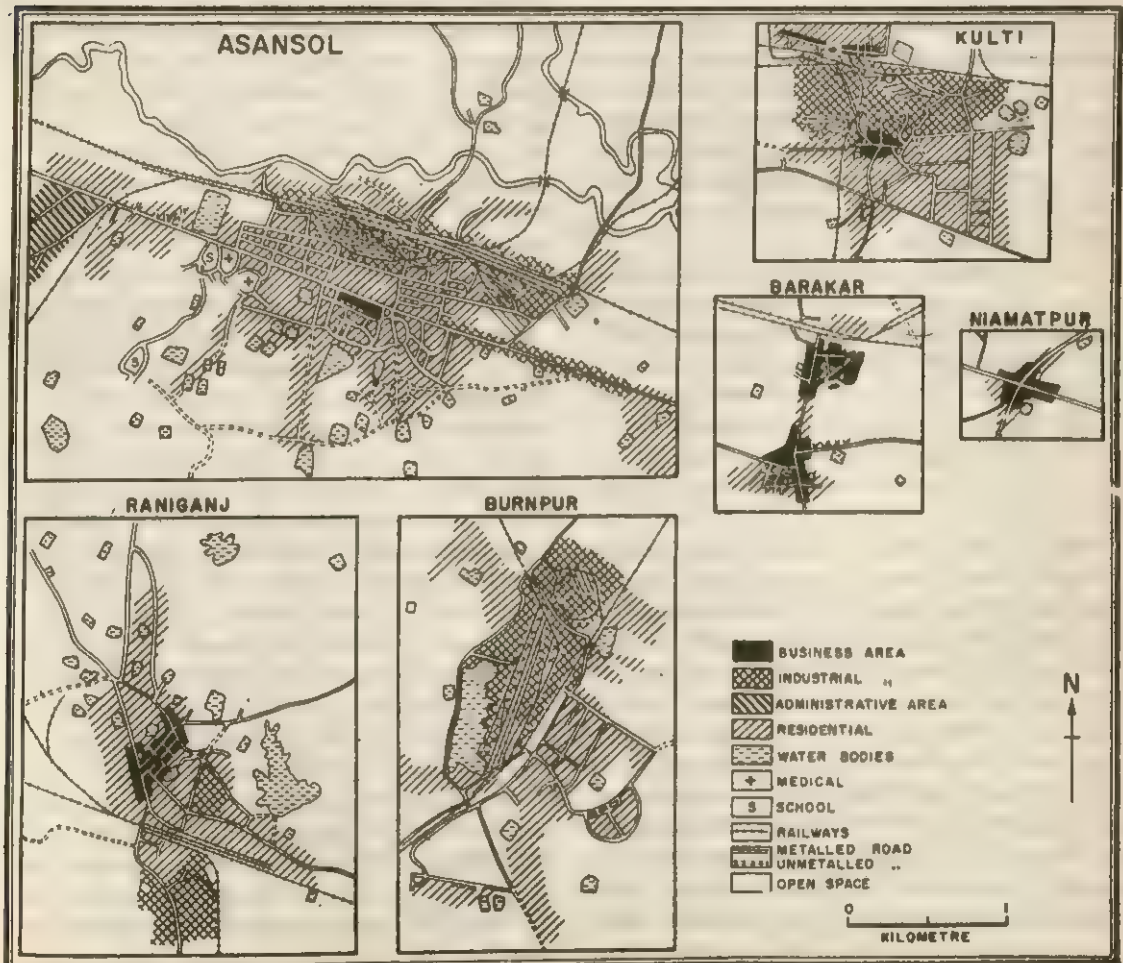


Fig. 6.16 : Some Towns of Raniganj Coalfields.

In Kulti there are two shopping areas; one between the industrial sector and upper grade colony and the other in the labour quarters lying in the northwest of the town.

Within this industrial-mining and agricultural expanse commercial service centres like Barakar (14,174) and Niamatpur (12,630) are quite significant. In Barakar, lying about 4 km west of Kulti, two market centres have developed, one taking the advantage of the railway station while the other, the main business area, still occupies the cross-road south of the railway station. Except some small scale industries, other functions are least significant. Niamatpur is a cross-road market town about 4 km south of Kulti.

Economic Landscape

The economic landscape of the region is dominated by agricultural, industrial and commercial activities and is more diversified. Each of these activities has its regional significance. During last two centuries four phases of economic development have been marked : (i) 1770-1870, (ii) 1870-1914, (iii) 1914-1947 and (iv) Post Independence Period.

The first phase was marked by the exploitation of people through high land revenue, imperial commerce and destruction of handicrafts which together destroyed the fabric of the economic life of the region. The famine further deteriorated the conditions reducing the population to 1/2 and cultivated area to 2/3. Population recovered slowly and its pressure on agriculture began to grow.

The rise in population and efforts towards opening avenues in non-agricultural channels mark the second phase. The advent of railway could break the relative isolation of the countryside resulting in change in the cropping pattern to produce raw materials for the distant markets leading to commercialisation and specialization in agriculture. The Crimean War gave a fillip to Jute cultivation and Jute industry eventually outstripping Dundee by 1910. By 1914 Calcutta and the Hooghly side had emerged as the most outstanding industrial complex in India. Jute, cotton, engineering, paper, chemical and ancillary industries had developed. Rail network, port

activities and the mineral exploitation of Bihar-Bengal belt contributed to this industrial development. The inter-war years witnessed diversification of industries and development of war industries so that by 1921 Calcutta-Hooghly side was responsible for 2/3 of the factory population of India. However, with industrial development elsewhere too, the share of factory population had fallen to about 1/4 by 1941. As many as 465,000 persons were engaged in industries accounting for 82% of the total industrial population of Bengal though it had only 57% of the factory units. The number of factory units rose from 961 in 1939 to 1450 in 1945 (6,50,000 workers).

The Partition of Bengal served as a disjoining force to the economy and supply of the region to start with, and the element of complementarity disappeared. No longer the jute and rice of East Bengal could be available to the Hooghly-side, while the dismembering of the water transport created bottle-neck for movement and loss of supplies of some of the essentials. However, some of the post-Independence developments like the D. V. C. Project, establishment of Industrial Estates, extension of jute cultivation in the region and outside, provision of new links with Assam, readjustment of boundaries with Bihar, settling of the East Bengal refugees in other areas, all these attempts have assisted in bringing relief and improvement in the economy of the region. In the post-Independence period, greater diversification took place in basic and heavy industries such as in the Durgapur-Chittaranjan-Asansol complex. Automobile industry and its ancillaries, heavy chemicals and port industries also developed in the region.

Agricultural Landscape : About 57% of the total working population is still engaged in agricultural pursuits. About 70% of the total area of the region is under cultivation. In general, North Bengal Plain is primarily agricultural. Regional variations in agricultural resources are associated with topography, soils, rainfall and irrigational facilities. A critical analysis of the components of land use indicates that areas under non-cultivable lands have gone down more in the western margin.

The percentage of culturable waste lands has also gone down as a large proportion has been reclaimed for various purposes. In the region such lands have been classified into 4 categories,²⁰ i.e., eroded (derelict lands), *Char* lands, *Tarai* lands (available on flat lands in the *Duars*) and alkaline lands especially over the western margins of the *Rarh* plain.

Net area sown represents above 50% of the total area which has increased appreciably during the last two decades due to developments in agricultural techniques. Highest increase (21-31%) in net sown area has taken place in West Dinajpur and Nadia. In the *Duar*, Jalpaiguri and Cooch Behar show an increase of 5-7%; while Burdwan and Midnapur in the Delta regions account for 2-3% increase. Some decrease (5-10%) in net sown area has taken place in some delta districts such as Howrah, Hooghly, 24-Parganas and Murshidabad.

There are four categories of agricultural land depending on their location. The *Sol* is the lowest portion where rain water collects, *Kanali* is its steep edge, *Baid* is the land gradually rising from the *Kanali* and *Danga* the crest of the undulations.

About 50,000 hectares of decrease in current fallow has been recorded in Jalpaiguri, Midnapur and Nadia mainly due to climatic fluctuations, limitations in wetness of soils and other socio-economic factors operating on individual holdings.

Double cropping has shown interesting changes during 1953-61. Generally *aus* lands are utilised for double cropping for growing vegetables and rabi crops. Only 11% increase during 1953-61 could be assessed in the land use for double cropping. However, this practice is more popular in the delta districts of Hooghly, Nadia and Murshidabad where 30% of increase under double cropping could be recorded (1953-61).

Irrigation

Irrigation facilities in the region are inadequate. Though the average rainfall is fairly high, yet irrigation is essential for agricultural prosperity due to irregular monsoons and dry winters. Moreover, water balance is adverse in the Lower

Ganga Plain region at various intensities. The completion of DVC and Mayurakshi Projects have now provided large scale irrigation. The highest percentage (60%) of irrigated area by Govt. canals lies in Burdwan, followed by Birbhum, Bankura (30%), Hooghly (29%) and Murshidabad (14%). Irrigation from ponds, *bils* and other sources is more popular in Murshidabad, Midnapur, Howrah (40%), followed by Birbhum, Bankura and West Dinajpur (32%). Well irrigation is not so popular except in Nadia, Malda and Cooch Behar where 20% of irrigated area is under wells. Double cropped areas are irrigated in the *Duars* and delta area, e.g., Cooch Behar, Nadia and Malda (30% each), Hooghly (17%), Murshidabad (15%) and 24-Parganas (11%).

Crops : Rice is by far the most important, covering 75% of the net sown area and 85% of the total cropped land. It also accounts for 90% of irrigated area. The yield and irrigated area correlation is well marked (cor. coeff. 0.89). *Aman* dominates throughout the region while *Aus* is significant in Malda, Cooch Behar, Nadia, Murshidabad and Bankura. *Boro* is least significant with 1% of cropped area. It is more confined to the marshy tracts of Howrah, Hooghly and 24-Parganas.

Jute as the cash crop stands second in importance with 4.3% of cropped area. It maintains, in general, second rank in Active Delta and the *Duars*. Elsewhere, except the western margin, pulses rank next to rice. *Til* in the western margin, vegetables in the suburban zones and tobacco in Cooch Behar are other crops of significance. Among the four types of agricultural lands *Sol* and *Kanali* are devoted to *Aman*, *Baid* to *Aus* and *Til*, mustard and groundnut are grown in *Danga* which is also used as pasture.

Crop-Association and Farming : Cropping in the Lower Ganga Plain is stable due to level land, and firm rotational practices. But there is enough scope for reorientation and new adaptations to the environments. Rice has been the most outstanding crop in terms of area and output. Rotation of crops indicates intensity of cropping in an area. It is noticed that two distinct rotations are prevalent in the region, i.e.,

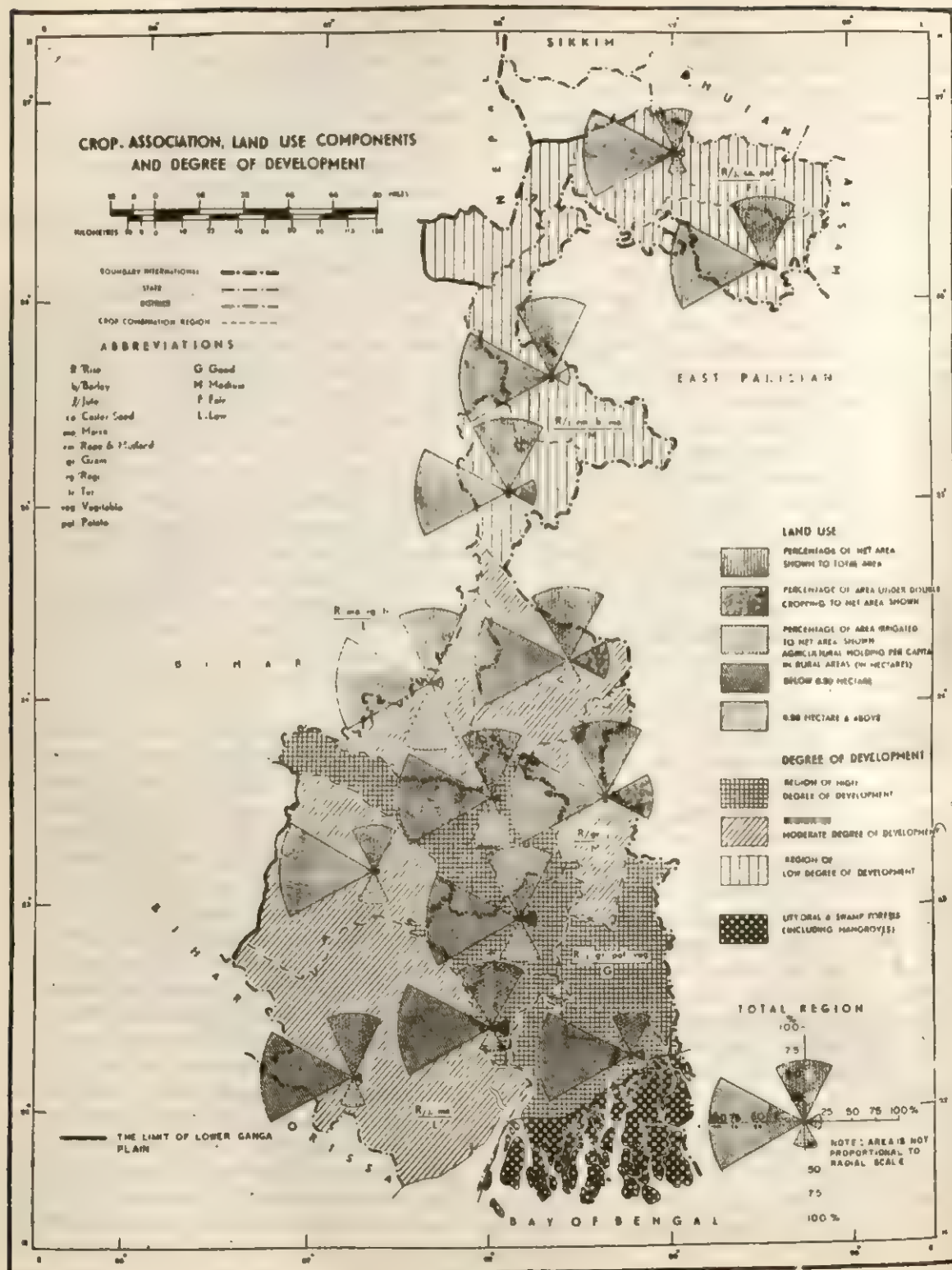


Fig. 6.17

(i) *Aman* fallow-*Aman* system in the lowlying fields while (ii) *Aus*-Jute-rabi pulses or vegetables system on the upland fields. In the lowlying areas (*Aman* rice fields), there is little scope for crop rotation. But over *Aus* fields several rotational practices may be developed, especially where maize, potatoes, vegetables, jute and rabi pulses are grown, provided irrigation and other facilities are available. Considering the crop-components, five crop associations in the region have been determined. Rice is the principal component which has got its privileged position on account of favourable factors for its cultivation. The North Bengal Plain shows two broad groups of associations of R/j, Ca, pot; and R/j, pm, b, ma. It is quite apparent that these crop-associations display some variation in cropping after the second rank. On the basis of yields of various crops, agricultural landscape has been rated as F(Fair) and M(Medium). The land use components do reveal significant characteristics of the regional response in cultivation, double cropping and areas under irrigation. In these zones agricultural holdings per capita are over 0.20 hectare almost in all districts. In the Delta Proper and on the western margin of *Rarb* plain,

three crop-associations have developed, viz. (i) R/j, gr., pot and veg; (ii) R/gr., j; and (iii) R/j, ma. Excluding a major portion of *Rarb* plain the agricultural landscape has been rated from fair to medium and agricultural holding per capita is below 0.20 hectare in general due to high concentration of population in agricultural pursuits (Fig. 6.17).

Fisheries : The preponderance of water-bodies, natural and artificial, and to some extent other environmental conditions like climate, acute shortage of agricultural lands and lack of other resources of animal protein, have led to the adaptation of fisheries in the region. Out of the total catch of 86,000 tons (1959)²¹, culture fisheries in tanks and ponds constitute about 58%, followed by estuarine fisheries (24%), riverine fisheries (15%) and marine fisheries (3%).

Although the fish culture forms a traditional occupation of almost all the households in the region, it dominates in the Delta Proper and the southern Barind tract. The common culture fisheries constitute *Rohu* (*Labeo rohita*), *Catla* (*Catla catla*), *Mrigala* (*Cirrhine mrigala*), and *Kalhouse* (*Labeo calbasu*). Apart from the fresh water *bils* and tanks, sewage fed fisheries in the salt lake areas of Calcutta (Fig. 6.18) are notable

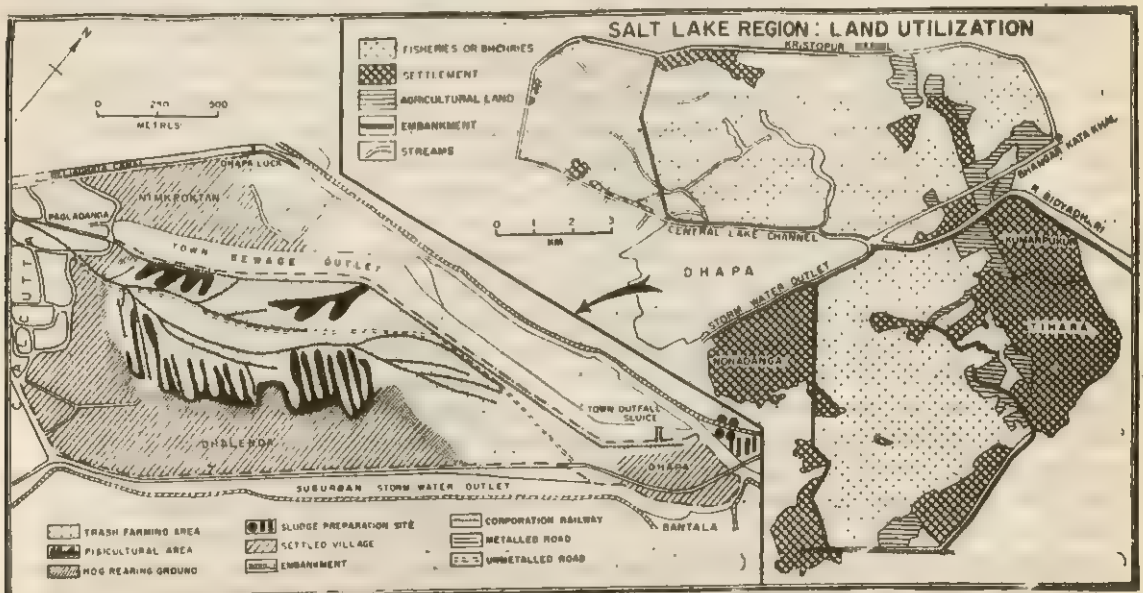


Fig. 6.18

where the yield per hectare is over 60 maunds (average yield for the State being only about 30 maunds per hectare). Riverine fisheries are important in 24-Parganas, Murshidabad and Midnapur which account for more than 90% of riverine catch. Hasanabad, Itindaghat, Port Canning, Diamond Harbour, Kolaghat and Lalgola are the main collecting and transport centres. Most of the riverine as well the culture fish are consumed locally. *Hilsa* is the most important commercial fish, common in the Calcutta market. The Sundarban areas are the favoured sites for the estuarine fisheries. Prawns (24%), quality fish such as Bhetki, *Hilsa*, Mullet, Sciandis, Mango fish, Pomfrets (56%) and low grade fish like Pangas, Aor, Silund, Gurjali etc. (20%) are the catches from estuarine fisheries. 75% of these are consumed fresh. With a coastline of about 65 km there is ample scope for marine fisheries but due to lack of equipment and adequate craft and berthing facilities only 32 km of coast between Junput and Digha (Fig. 6. 3 Inset) are being effectively used. The catches comprise 30% prawns, 40% quality fish and 30% low grade fish. Junput is developing as an important fishing centre here. There is a little impetus for off-shore fishing.

Even these resources of fisheries do not suffice the local consumption and hence the region has to import about 30,000 tons per annum from other regions including East Pakistan. To achieve this end good storage facilities, heavy trawler and cheap and quick transport facilities are essential. At present all the inter-regional fish movement service is provided by railways which are finding it difficult to cope with the increasing demand. Its popularity in diet can very well be emphasized with the per capita annual consumption of more than 4 kg against the national consumption figure of less than 3 kg. With mechanised and organised development of fisheries the region may become self-sufficient as well as fetch foreign exchange by export.

Industrial Economy

The region is richly endowed with minerals, mainly coal, water and man power and has access to the mineral belt of India as also to other

raw materials. The main industrial concentrations have developed in the Hooghlyside and Asansol-Durgapur belts which together account for about 92% of the total industrial employment of the region. About eleven groups of industries have sprung regionally (Fig. 6.19).

Major textile industries are located in 24-Parganas and Nadia (Calcutta industrial belt), while smaller establishments are in Bankura and Murshidabad. The Calcutta industrial belt is responsible for employing about 80% of the total workers in the delta region in the manufacture of jute textiles, the highest proportion being in Howrah (79%) and Hooghly (72%). Among all groups of chemical industries, the highest proportion of workers is engaged in synthetic rubber and rubber products, the spatial break-up being 41% in Calcutta, 55% in 24-Parganas and 63% in Howrah. The metal-based industries are also concentrated with highest proportion of all categories of factories in Howrah (387), Calcutta (275), 24-Parganas (205) and Burdwan (20). Iron and steel industries employ the highest percentage of workers of the district totals of metal based industries in Burdwan (94%), 24-Parganas (93%), Calcutta (82%) and Howrah (77%). The next important metal-based industries are aluminium and structural steel products.

Other industries such as wood-based, leather, food-processing, transport equipment etc. are concentrated in different parts. Among these, the North Bengal Plain accounts for mostly wood-based, beverages and tobacco and food-processing industries. The Hooghly industrial belt (rather the delta proper) is a zone of diversified industries while the Asansol-Durgapur complex is specially noted for metal and chemical-based industries. The regional disparity in industrial landscape is obvious due to the uneven distribution of industrial resource base and under utilization of economic infra-structure. However, the Delta Proper has a wider base for industrial development and location of diversified industries, if considered on the basis of distribution of all classes of industrial establishments and proportion of workers deriving livelihood from them (Table 2).

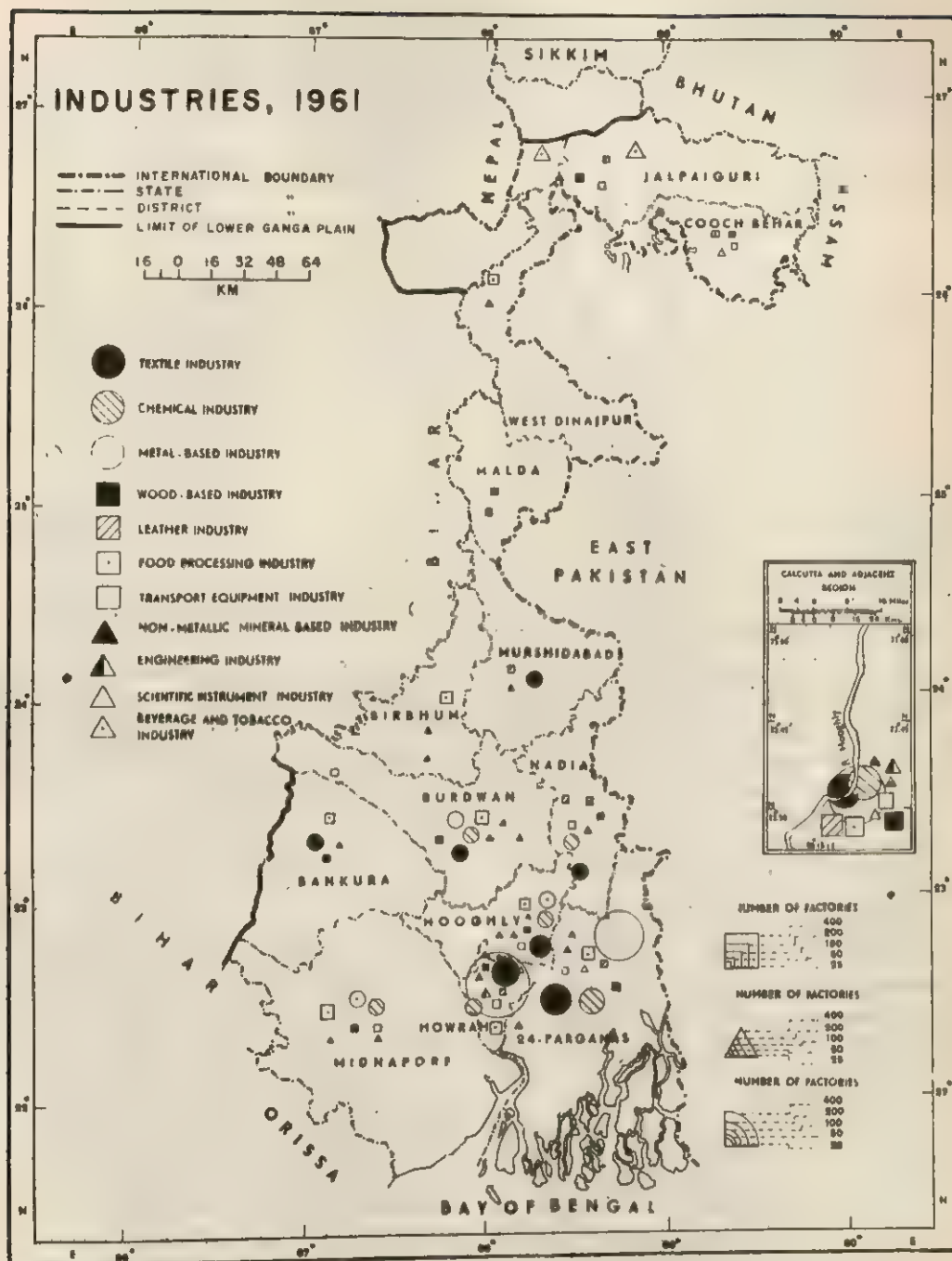


Fig 619

TABLE 2
Distribution of industries, factories and employment, 1961

Regions of First order	Districts included wholly or partly	Total No. of factories (all classes)	No. of workers (all classes)	Percentage of the total workers
North Bengal Plain	Jalpaiguri	215	20,042	3.07
	Cooch Behar	11	436	0.06
	West Dinajpur	33	1,695	0.26
	Malda	4	83	0.01
Delta Proper	Murshidabad	9	1,309	0.20
	24-Parganas	530	220,786	33.88
	Calcutta	1,010	119,223	18.29
	Howrah	659	132,544	20.34
	Hooghly	129	70,559	10.81
	Burdwan	177	5,763	8.84
	Nadia	21	2,978	0.45
The Western Margins of the Delta	Bankura	54	2,593	0.39
	Midnapur	91	16,764	2.57
	Birbhum	73	4,977	0.76
Total		3,021	651,626	100.00

Transport : Quite in harmony with the location at the transshipment point of water and surface-borne traffic, a fairly good transport net with wide spatial variation has been developed in the region even against a rather unfavourable terrain (Fig. 6.20). The transport arteries of the region, in addition to catering to the international movement of goods, have to haul huge amount of inter and intra-regional traffic such as cereals, jute, tea, coal and other minerals and industrial products etc. Prior to the advent of the quicker and more assured surface transport arteries, the railways and the roads, the perennial streams like the Ganga and the Brahmaputra served as the link between the ports along the Hooghly basin and the interior hinterlands.

The river-side centres are now experiencing deterioration at the hands of (i) the oscillatory channel characteristics, (ii) the advent of the more stable surface transports which had the advantage of penetrating the forest-clad interiors, and (iii) the partition which disrupted the whole of the river transport and much of our jute and tea shipment from Assam and the North Bengal

Plain has left it at the goodwill of the Pakistan Government, though there are still 27 partly or wholly navigable streams of different sizes and 10 canals; the northern water routes excepting the Mahananda are obstructed by the international border with Pakistan.

Though the region has the highest density (0.42 km/km²) of the railroads in the country, yet 25% of its area still lies at a distance of more than 16 km from any track. These chunks lie in the SE Active Delta, the *Duars* and the undulating *Rarh* except the Asansol-Durgapur industrial belt which rather equals the Hooghly Basin conurbation in density. Surface links with Assam and the *Duars* have become more circuitous after the partition. For this region, where huge traffic originates and terminates, the existing tracks are not able to cope with. Moreover, the marshalling yard at Siliguri presents the bottleneck for smooth movement of distant traffic. Calcutta-Howrah is the main convergence of the railways. Electrification, bridging up of the interrupted links and modernisation of the tracks will go a long way to improve the rail transport

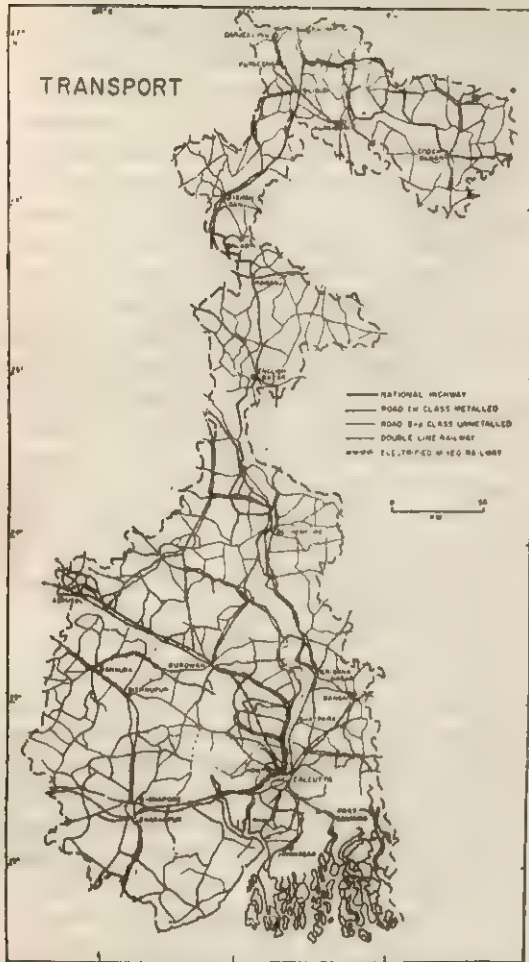


Fig. 6.20

in the region. The metre and narrow gauge tracks are uneconomic and need replacement by broad gauge tracks.

Like the railways the region has also the highest density of roads of all kinds. The 25,000 kilometres of roads (excluding the 1200 km of village roads) include partly or wholly at least 5 national highways (nos. 2, 6, 31, 34, and 35) including the Grand Trunk Road (NH2). Swamps and oscillating river channels provide the greatest hindrance to smooth transport.

With Dum Dum as the busiest airport, both national and international, the region enjoys significant position on the air map. Apart from

handling the distant traffic, it has also to provide air connections to the Meghalaya, Manipur, Tripura, Nagaland and Assam which have lost direct surface connection owing to partition. Local flights to the Duars are also available.

The Regions

The Lower Ganga Plain, apparently a homogeneous geographical entity exhibits significant variations in geographical phenomena, both physical and cultural, which render feasible the delineations of somewhat more uniform lower order units depending on different attributes. Within this region of alluvial morphology throughout its spread from the foot of the Himalaya in the north to the Sundarbans and the Kanthi Littoral in the south, remarkable variations in the physical settings exist, which have their imprints on the total cultural landscape of the region. The northern districts (north of the Ganga) have the turbulent tributaries of the Ganga and the Brahmaputra, which, while dissecting this tract of older alluvium, have rather contributed to the development of distinct cultural patterns including human occupancy units as also the patterns of transportation. Likewise, the region bordering the Chotanagpur Highlands has relatively more stable configuration with greater diversity of physical resources and consequent differentiations in the cultural landscape. In contrast, the Delta Proper is characterised by the 'old mud, new mud and marshes', being a playground for the dynamics of the streams leading to accordant changes in the physical as well cultural landscape. Thus, the Lower Ganga Plain can be divided into three first order regions : 1. The North Bengal Plain, 2. The Delta Proper and 3. The Rarh Plain or the Western margins of the Delta; and further, 8 second order and 21 third order regions are distinguishable as follows (Fig. 6.6):

Regional Scheme

The Lower Ganga Plain :

9. North Bengal Plain

(a) Duars

- (i) Western
- (ii) Central
- (iii) Eastern

- (b) Barind Tract
 - (i) Kosi-Mahananda corridor
 - (ii) Mahananda-Tista Interfluvium
 - (iii) Cooch Behar Plain
 - (iv) Southern W. Dinajpur Plain
 - (v) Malda Plain
- 10. Delta Proper
 - (c) Moribund Delta
 - (i) Murshidabad Plain
 - (ii) Nadia Plain
 - (d) Mature Delta
 - (i) Burdwan Plain
 - (ii) Howrah-Hooghly Plain
 - (iii) Midnapur Plain
 - (e) Active Delta
 - (i) Northern
 - (ii) Southern
- 11. Rath Plain
 - (f) Birbhum-Asansol Rath
 - (i) Birbhum Plain
 - (ii) Ajai-Damodar Interfluvium
 - (g) Bankura Rath
 - (i) Damodar-Dwarkeshwar Doab
 - (ii) Dwarkeshwar-Kasai Tract
 - (h) Midnapur Rath
 - (i) Eastern
 - (ii) Western

Unassorted materials and older alluvium (lateritic) constitute the surface of the *North Bengal Plain*. The swiftly flowing Himalayan streams, the Mahananda, the Tista, the Jaldhaka, the Sankosh drain the area with frequent shifts in their channels, the Tista and the Mahananda being more notorious. The proximity to the Himalaya has provided the region with distinguishing character as the rainfall is high (more than 300 cm) and summers are less severe (average max. temperature lower than 28°C). Though the interaction of man and nature is relatively older here than in other parts of the Lower Ganga Plain, it could not sustain its supremacy probably owing to its relative isolation and as such still exhibits the lowest population density (below 300 per km²) with overwhelming rural population (92%), and the primary sector economic base still dominates, engaging over 80% of the

workers except in Siliguri where the impact of the urban centre reduces the proportion of rural to 55% and of primary sector workers to 71%. Though rice and jute are the prevailing regional crops, tea plantation and mining in the northern section (Siliguri and Jalpaiguri) and agriculture and mango orchards in the southern, are distinguishing features at lower levels. Secondary occupations are least developed except in Malda where silk spinning and weaving are of considerable significance employing about 13% of its working force. In this least urbanised zone there is preponderance of small-sized rural settlements (about 50% in Cooch Behar to over 76% in West Dinajpur) except in Jalpaiguri where medium-size villages (65%) predominate and where the number of large villages is also fairly good. Development index is low throughout. Scheduled castes and tribes including the ruling castes like Rajbansis (Cooch Behar) are in greater proportion. Thus (a) the *Duars* in the north and (b) the *Barind tract* or the *Tista Flood Plain* in the south become second order regions of the North Bengal Plain. The former comprising Jalpaiguri and Siliguri is the zone of coarser alluvium (Tarai type), forested tracts and 'confined' water channels; tea plantations are dominant in its western and central parts but the western part becomes distinct from the central due to greater urbanization under the influence of Siliguri; whereas small scale mining distinguishes the eastern section from the other parts. Thus the three third order units are (i) the *Western Duar* or *Siliguri Duar*, (ii) the *Central* or *Jalpaiguri Duar* and (iii) the *Eastern* or *Alipur Duar*.

The Barind tract comprises Kishanganj, Cooch Behar, West Dinajpur and Malda and continues eastward into E. Pakistan. It is coterminous with the former Rajmahal-Garo alignment. Vigorous river action has imparted somewhat undulating character to this region. Intensity of *bils* increases southward, being maximum in Malda, where linear settlements stand in contrast to the general settlement patterns of this sub-unit, though some degree of lineation is also observed in the Kosi-Mahananda corridor. Cooch Behar and Malda are relatively densely settled than the

other parts. Proportion of workers to total population (32-35%) is higher than the average for the Lower Ganga Plain. Thus five third order units may be distinguished : (i) Kosi-Mahananda corridor or Kishanganj Plain with lowest population density (237), (ii) Mahananda—Tista Interfluve, (iii) Cooch Behar Plain, (iv) Southern Dinajpur Plain and (v) Malda Plain.

The Delta Proper is a relatively lowlying region comprising Murshidabad, Nadia, 24 Parganas, Calcutta, Howrah and Hooghly, and parts of Burdwan and Midnapur. It is here that the great industrial conurbation of Calcutta has developed on a rather least favoured physical site. *Bils*, swamps, *chars*, levees, *Dangas* and coastal dunes are the only features of physical prominence. More than half of the population of the Lower Ganga Plain is concentrated here though unevenly distributed (density 450 to about 1,400 per km²) and also in agglomerations of varying sizes ranging in population from less than 200 to over 2.5 million. Considerable urbanisation has progressed (39%) and the total urban population (about 7 million) accounts for over four-fifths of the Region's urban total. This sub-region has more diversified economic base than the other two sub-regions. Within this somewhat urbanised and industrialised agricultural zone, the human and economic developments very often correspond with the geomorphic conditions as the zone of dead and decaying rivers, rather a sort of shadow zone between the Padma-Bhagirathi fork, it does not exhibit developments parallel to the lower eastern Hooghly Basin and so also the delta proper lying to the west of the Hooghly. Thus, the overall analysis of the physico-cultural attributes leads to distinguish three second order regions : (c) *The Moribund Delta* or the Region of dead and decaying rivers, (d) *the Mature Delta*, and (e) *the Active Delta*.

The Moribund Delta, comprising Murshidabad and Nadia districts, has transitional character with a northward increasing dominance of agricultural economy. Household industry is common throughout the region. Silk and conch shell industry alongwith paddy cropping and greater proportion of rural population (91%) distin-

guishes (i) *Murshidabad Plain* from the somewhat more urbanised (18%), industrialised (manufacturing workers 5%) and Aman-Jute culture region, (ii) *the Nadia Plain*. The Bhagirathi divides the Murshidabad Plain into the western and eastern sections, which differ in settlement patterns and frequency of *bils* and are locally known as the *Rarb* and the *Bagdi* (Bagri) respectively. In Nadia Plain the Hooghly-side marks the continuance of the great industrial conurbation and thus the western section of the plain becomes distinguishable from the eastern section.

The Mature Delta is an area of choked rivers lying to the west of the Bhagirathi-Hooghly. From north to south the economic structure and the degree of urbanisation and development differ. Thus (i) the *Burdwan Plain* has dominance of Aman paddy, relatively lesser urbanisation (18%) and high degree of development while (ii) the *Hooghly-Howrah Plain* has Aman-Jute culture with fairly high urbanisation (34%), more workers engaged in manufacture (about 50%) and high degree of development. Considerable variation exists even in Hooghly and Howrah areas in degree of urban and industrial developments. In the Burdwan Plain the Hooghly-side industrial and urbanised belt leads to the delineation of 2 fourth order regions, Burdwan Plain East and Burdwan Plain West. (iii) *The Midnapur Plain* is the least developed region in the Mature Delta with moderate degree of development, *Aman* rice culture and least urbanisation (8%). Primary sector employment (77%) dominates. In this region Midnapur-Kharagpur area is emerging as the third industrial pocket in the Lower Ganga Plain and thus becomes distinct from the dune-infested coastal tract where the dominance of fishing becomes natural; the central tract in between stands as a distinct unit.

The Active Delta occupying the S. E. corner is the land of marshes, levees, saline water lakes and the coastal forests. It is characterized by high urbanisation (55%) and over-all high degree of development; yet the intensity of sub-regional disparity is not so high anywhere else in the Lower Ganga Plain. (i) *The Upper Delta* (Nor-

thern) has the highest degree of development, agricultural (Aman-Jute region) in the east and industrial (constituting a part of the great Hooghly-side conurbation along with Calcutta) in the west; the Bidyadhary-Peali tract is emerging as a unit of mixed agricultural and industrial economy; (ii) the Lower Delta (Southern) has the zone of tidal forests of Sundarbans in the south as also a zone of patchy cultivation by reclamation in its northern section.

The *Rarh Plain* consists of Birbhum, Bankura and western part of Burdwan and Midnapur districts. This lateritic region with exposures of the Gondwanas experiences different climatic conditions from the rest of the Lower Ganga Plain. The region is characterised by semi-compact and sprinkled settlements with occasional riverside lineations. Lower population density with predominant agrarian economy, except in the Ajai-Damodar interfluvium is remarkable. On the basis of variations in surface configuration and the type of economy and level of economic development, three second order regions may be distinguished: (f) the *Birbhum-Asansol Rarh*, where the northern tract, (i) the *Birbhum Plain*, predominantly rural (93%) with *Aman* culture and moderate degree of development, stands in contrast to (ii) the *Ajai-Damodar interfluvium* which has developed as an important industrial and urban concentration (13 towns) and has high degree of development. (g) the *Bankura Rarh* is distinguished by its lower urbanisation, preponderance of primary sector employment, low population density and lesser development of transport arteries. Here again (i) the *Damodar-Dwarkeswar Doab* differs from (ii) the *Dwarkeswar-Kasai Tract* due to some mining activity. (h) The Midnapur Rarh is divided into two third order regions: (i) *Eastern* and (ii) *Western*; the former is more developed than the latter due to the influence of Kharagpur.

The above regional treatment of the Lower Ganga Plain will hardly be complete if due attention is not paid to the Calcutta conurbation, the pivot of the economic activities of the region as a whole, and forming a functional region of supreme importance.

The Calcutta Conurbation : A Functional Region²²

For the first time mention has been made of Calcutta conurbation in the 1951 Census of West Bengal, when the Census Superintendent, in his pioneering zeal delineated the Calcutta Industrial Region on the Hooghly-side in recognition of 'a certain demographic, economic, industrial and geographical unity'—a fact surmised and hinted at since 1921, but not avowedly expressed by any government agency.

The total area covered by the conurbation is about 425 km² of which the core cities of Calcutta and Howrah occupied 92 km² and about 26 km² of area respectively. The overall population density of the industrial region was 10,085 per km² (1941 : 8,620) with a density of 19,011 in the city tracts and 4,070 in the town areas. The density varied from the maximum of 30,033 in Calcutta (1941 : 24,070) down to 853 (1941 : 330), in North Dum Dum, a residential suburb of Calcutta, with 10 other urban centres falling between 23,000-7,000 figure and 23 towns between 7,700 and 1,540 persons per km².

Within the last inter-censal decade (1951-61) the Calcutta industrial conurbation has expanded tremendously in spatial, demographic and socio-economic dimensions. This has been achieved through the process of (a) accretion of peri-urban settlements, industrial and residential suburbs gaining urban status due to rapid change in proportion of the non-agricultural workers; (b) municipal annexation of urbanised tracts, settled areas etc., lying adjacent to existing urban nodes; (c) constant expansion of transport network, especially of bus services from the central cities and the industrial towns into the peripheral areas, bringing in large volume of commuters and (d) rapid growth of population and steady rise in density both in urban tracts and in adjacent areas due to heavy influx of migrants, industrial labourers and displaced persons from beyond borders of West Bengal. In view of the enlarged and expanded industrial conurbation, the Registrar General, India, attempted to delineate the region taking the criterion of high incidence of non-agricultural working force of the smallest admi-

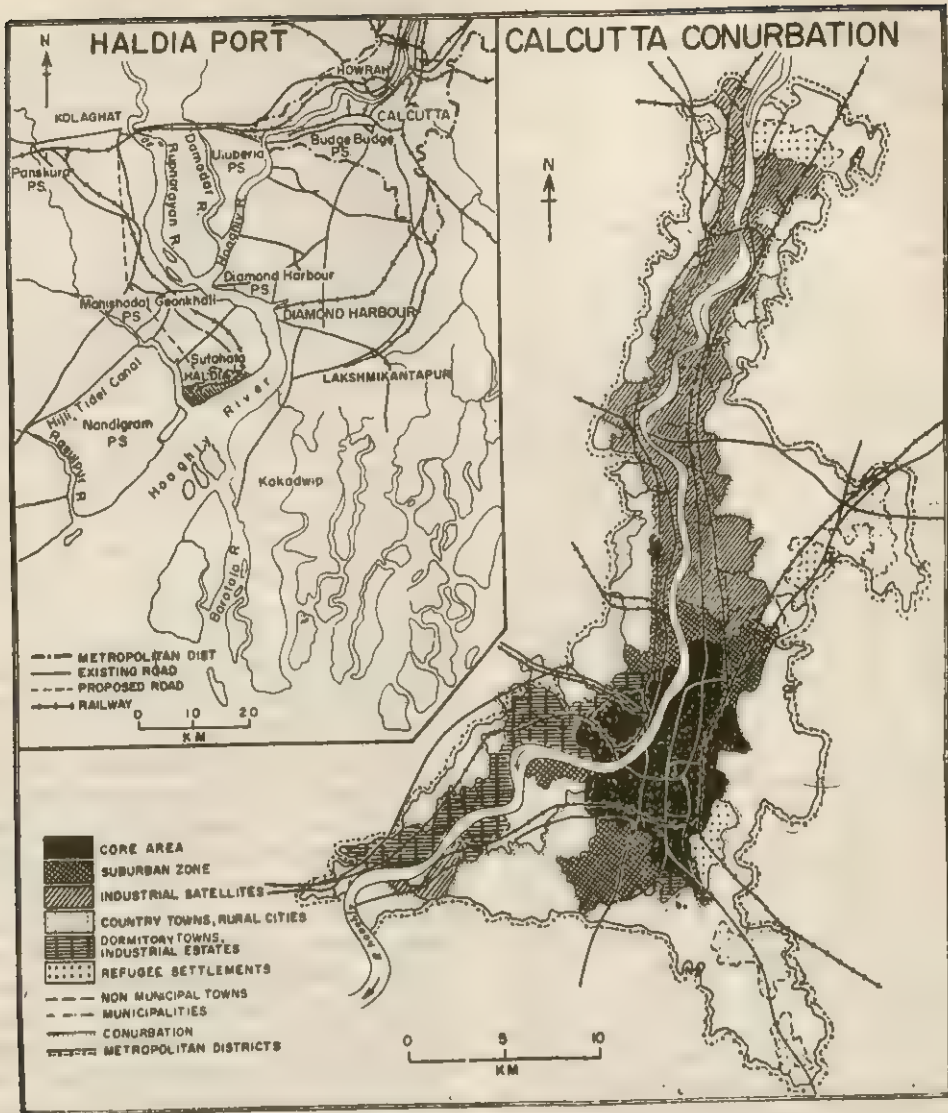


Fig. 6.21

nistrative areas (Police stations) as units. This conurbation area of 1961 encompassed 67 cities and towns (Tollygunge being merged with Calcutta) and other peripheral towns, urban settlements, townships having close economic and social link with Calcutta brought under the purview of the new industrial conurbation, raising the total urban centres to 81. The Calcutta Metropolitan Planning Organisation (CMPO), the new

planning agency, embarked upon the task of delimiting a conurbation core and a metropolitan district as planning units of comprehensive urban and regional planning. The Calcutta Metropolitan District (CMD), thus evolved, had an area of about 1,040 km² along the Hooghly encompassing 2 corporations, 33 municipalities and 42 non-municipal urban units extending from Baruipur-Budge Budge in the south to Bansberia-Kalyani in the north in

addition to 475 densely settled and semi-urbanised outlying rural communities around the urbanised zone. This area is little more than 1 per cent of the total area of West Bengal, and contains 17 per cent of the total population and 75 per cent of urban population of the State. The population load of the C.M.D. is 6.72 million, with an overall density of 6,550 persons per km², the density varying from 12,070 in urban areas (maximum in Calcutta with 30,360 persons per km²) to 1,350 in rural semi-urbanised fringes. The outer boundary was defined not only in terms of extent of highly urbanised heavily built-up existing areas, but also on the basis of densely settled rural tracts, having high incidence of non-agricultural working force, suitability of future settlement growth and their potentiality for future urban expansion in a planned way.

Industrial Activities in Calcutta Conurbation : The industrial structure of Calcutta conurbation in mid-20th century was dominated by manufacturing activities connected with jute products, textile, hosiery, apparels, leather, basic metal and metal products, engineering goods, machinery, transport equipments, chemicals, paper, printing, food, agricultural industries etc., with as many as 13 towns having predominant manufacturing activity to the exclusion of other activities to any significant level (with zonal average as significant level). They are Titagarh (a paper mill town), Naihati, Halisahar, Uttarpara, Bally, Champdani, Kotrung, Bhadreswar, Uluberia, Bauria, Kamarhati, Budge Budge, all jute mill towns *par excellence*. The percentage of manufacturing employment was maximum at 73.81 in Halisahar (specialising in jute, paper, hosiery), and the minimum of 54.55 in Batanagar, (an exclusively shoe manufacturing town). In other 17 towns the manufacturing activity was above the significant zonal level, being associated with heavy transport activities in Howrah (a great railway terminus), Garden Reach (adjoining the Calcutta port), Kanchrapara (a railway workshop town); with services in Chinsura, (a District headquarters) and with public administration in North Barrackpore and Barrackpore (a Sub-divisional administrative town) and Ishapore (a gun-factory town).

The rest were associated with utilities. Thus, manufacturing activity was found to be the single dominating activity in the industrial landscape of the Hooghly valley. Of the non-manufacturing towns, only one was purely commercial town (Chandranagar, an old French administrative settlement), while commerce associated with services was found in Tollygunge (a residential suburb of Calcutta). Service activities of various kinds were found associated with transport and utilities in another 4 towns of Barrackpore Cantonment (a military town), and Dum Dum, North Dum Dum and South Dum Dum, all residential appendages of Calcutta.

In 1961 also the urban industrial structure of the C.M.D. was found to be overwhelmingly dominated by manufacturing activity including household industries in as much as out of 77 urban units, industry was the single dominant function in 50 towns, industry along with services, commerce and transport was found in 17 towns while the remaining 10 urban centres were either predominantly service or service-cum-commercial or transport towns. Thus the city of Calcutta is an industrial-cum-service centre while all the other 7 cities with more than 100,000 population are industrial. Service activity is singularly predominant in dormitory township (Kalyani), administrative headquarters (Barrackpore), peripheral rural service centres (Baruipur), newer refugee settlements (Nabapally) and residential suburbs of Calcutta (Jadavpur, Bandroni, Purba Putiary etc.). Service-cum-commerce is dominant in Gayeshpur Government Colony, a planned refugee settlement, and in Rajapur, a rural service centre. All other service activities are associated with industry, there being no other town with commerce as single dominant function.

Problems and Prospects

The region, though endowed with rich alluvial soil, abundant basic raw materials, numerous perennial streams and a sea face which together could attract large number of people is now confronted with certain acute problems, both physical and socio-economic. The factors which induced

the rapid economic development of the Hooghly-side have themselves generated a chain of complex problems in the very wake of vigour of development which on the regional level was so much lop-sided or uncontrolled that even the exceptionally developed areas could not resolve the attendant problems, while the undeveloped areas (e.g., North Bengal Plain) lagged far behind in economic development and have even remained subject to centrifugal rather than to centripetal forces. This state of affairs calls for the creation of counter-magnets of the like of Haldia to relieve Calcutta of its overburdens.

As a frontier zone of the Great Plains, the region was a 'prized land' in the past, now as a maritime base; also the Hooghly-side has attained developments *par-excellence*. But the Partition has caused disintegration of the marine face and is hampering the integrated development of the entire backyard. While we have a real need to re-energize our decaying rivers owing to physical changes in river regimes, Pakistan shows her zeal to check our efforts by fostering aloud her claims to the Ganga waters though the Brahmaputra more than compensates her requirements.

Calcutta : The Problem City : Calcutta, a typical example of a 'chance-elected and chance-directed city' has grown haphazardly not only in its physical plan but also in terms of the provision of economic opportunities commensurate with the needs of a metropolis of its size. The World Bank Mission has rightly remarked "overcrowding, degradation of housing, health hazards, primitive water supplies, lack of space for new industries, traffic bottlenecks, power shortages, a still unsolved (rather growing) refugee problem—these conditions nurture feelings of unrest and malaise in the population which are likely to boil over from time to time in ways that are both destructive and inimical to orderly economic development".²³

The picture is too dismal as "1/4 of the population is living in Bustees (Shanty towns) which cover 1/7th of Calcutta's area; 34% of the families cannot claim even one single room for their exclusive use, 33% have only one room, 30% have no water tap attached to their houses, ... 61%

have no bathroom, 78% have no separate kitchen, 45% have no electric connections (and) 60% of Calcutta has no sewerage".²⁴ The city provides only 0.16 hectare per 1,000 persons for recreation as against the minimum standard of 1.6 hectares for the developing countries. Even the lanes and streets are too narrow to cope with the traffic as only 8.3% of total area is in transport use as against 30% in modern cities.

However, Calcutta as a dynamic metropolis has the essential vitality to meet the challenge of the situation. Various national and international efforts are being made to relieve the metropolis of its ills. Under the auspices of the State Irrigation and Waterways Department, efforts are being made to reclaim a vast marshy tract to the north-east and east of the city by dumping the dredged out silt and sands of the Hooghly. Further, a new Salt Lake City is envisaged on a reclaimed ground on the eastern fringes of Calcutta by a Yugoslavian Firm, initially to accommodate about a quarter million people in about 10 km² of area and further to be expanded to house another three million people in two other suburban townships to the NW and SE of the city.

Last but not the least in importance is the improvement of Calcutta Port which serves a hinterland covering more than 1/4th of country's area with 150 million inhabitants. Hopes hang on the Farakka Barrage to revitalise the Bhagirathi while the auxiliary port at Haldia (Fig. 6.24), about 95 km downstream, would serve the double purpose of releasing the pressure of the port as well as of the city. Around Haldia, at present, about 1.8 million persons are scattered in 262 villages over 400 km² of area; it is justly being developed into a viable port-cum-industrial city. Haldia is expected to handle "practically all bulk cargo for the Eastern Zone" amounting to 10 million tonnes, apart from some general cargo. Industrially, it will soon have an oil refinery with an annual capacity of 2.5 million tons and will develop a petro-chemical-cum-fertilizer complex, apart from various port engineering activities.

Need for a Balanced Regional Development : The problems of Calcutta and the Hooghly-side call for the development of not only the different sub-

regions of the Lower Ganga Plain but also need rather more immediately the planned and integrated development of several counter-magnets in its vast hinterland as well as to arrest the Calcutta-ward flow of people and opportunities.

The remodelling of the existing transport links and laying down of the new ones will facilitate the movement of bulky goods like jute, tea, coal and other minerals alongwith the fish. Fisheries have the problem of their own; these need be organised on co-operative basis with adequate arrangement for canning, warehousing and transportation. The reviving of water transport may release the extra burden on railways and roads. The swampy chunks in the S.E. and the S.W. Rarely lack adequate road and railway facilities.

The laying down of additional lines will help improving the conditions and developing agro-industries there. The seasonal roads in the *Duar* hamper the movement of tea. The modernisation and through connection will maintain regular flow of tea. Being a perishable item, tea requires quick transit and adequate warehousing.

The Naxalbari-type of civil agitation thrives on regional and sectoral imbalances, which can be resolved by stimulating capital formation and investment to the advantages of all as also to the different regions. An attempt to establish Finance Corporations at regional levels with a view to stimulating economic growth to remove regional disparities in the vast hinterland is an urgent necessity.

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The Assam Valley or the Brahmaputra Valley, ($25^{\circ}44'$ — $27^{\circ}55'$ N and $89^{\circ}41'$ — $96^{\circ}02'$ E) though the eastern continuation of the Great Plains of India, is a well-demarcated physical unit within the girdle formed by the Eastern Himalaya, Patkai and Naga Hills and the Garo-Khasi-Jaintia and the Mikir Hills. Extending from the easternmost tip of Upper Assam near the syntaxial bend of the Eastern Himalaya to the west of Dhubri on the border of East Pakistan, the valley (about $720 \text{ km} \times 80 \text{ km}$) covers an area of about $56,274 \text{ km}^2$. The valley includes the administrative districts of Lakhimpur, Sibsagar, Nowgong, Darrang, Kamrup and Goalpara of the state of Assam, which

according to some authorities appears to have been derived from *asama* (Sanskrit) meaning peerless or unequalled, while "others hold that the name is was given by the Ahoms, a ruling class from Burma"¹ (Fig. 7.1). Some scholars opine that the name is associated with the uneven nature of its terrain. The boundary is demarcated by the NEFA and Bhutan in the north, East Pakistan in the west, the Meghalaya in the south, the Nagaland in the south-east and the Tirap Division of NEFA in the east. This location of the valley has lent it a viable position socially, economically and politically over its surrounding administrative regions.

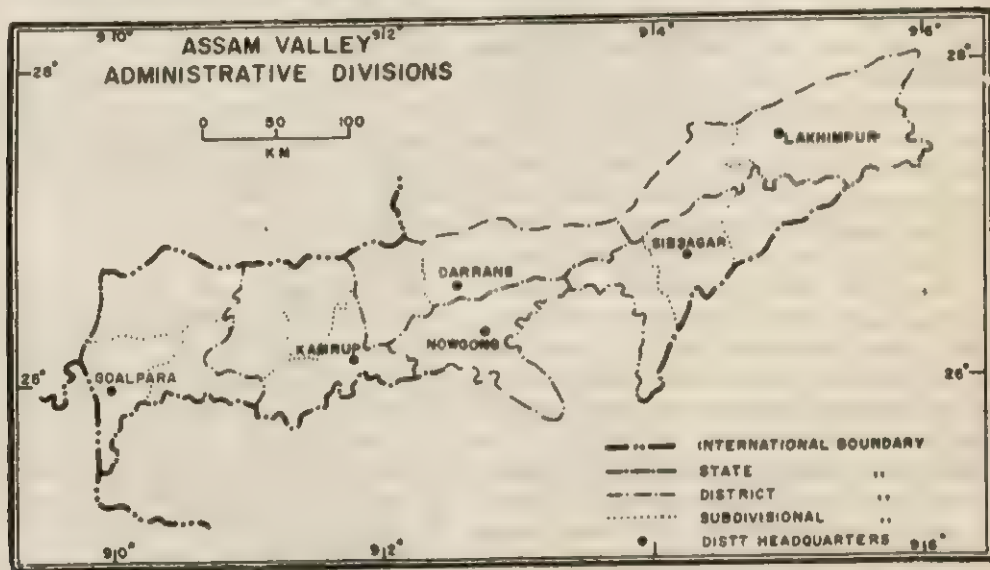


Fig. 7.1

Historical Background

Very little authentic archaeological work or historical research has been undertaken to facilitate the reconstruction of the process of its human

occupance since early times. However, whatever piecemeal works have been done and facts interpreted by the British and the subsequent local research sholars, it may undoubtedly be said that

the region has a rich ancient heritage dating back to the epic period when this region was referred to Pragjyotisha and Kamrup with its capital at Pragjyotishpur, the present city of Gauhati. The kingdom of Kamrup included an elongated stretch of land extending from the Burmese border on the east to the Karatoya, a tributary of the Tista in the west and it roughly included within its boundaries the Brahmaputra valley in addition to the Rangpur and Cooch-Bihar districts of Bengal and the kingdom of Bhutan.

Human settlement in this region probably, dates back to 2000 B. C. since when, it is known with certainty that, "there was a movement of population from the banks of the Hwangho and the Yang-Tse-Kiang in China to India through Assam and these Mongolian people, along with others who migrated from Northern Burma formed the bulk of the population of Assam".² Subsequently there were waves of migrations into Assam through the northeastern routes. These migrants who were rather invaders, belong to what is called the "Indo-Chinese linguistic family" of which the two most important sub-families are *Mon-Khmer* and the *Tibeto-Burman*. The third, *Siamese-Chinese* includes *Shan*, which was spoken by the *Ahoms*, the last of these invaders. Out of these three mongolian groups, the valley has at present descendants of the last two, known as the *Boro-Kacharis* and the *Ahoms* respectively, while the first group settled in the Khasi and Jaintia hills lying to the south of the valley. It may be noted here that about the time when the first wave of Mongolian immigration swept the north-east part of Assam, the Aryans had made their way into Punjab Plains and continued their wave of migration farther eastward. A group of the Aryans in their eastward move entered Assam through Bihar and North Bengal and had spread their culture and civilisation in the western part of the valley. It is claimed by some scholars that a group of Aryans penetrated far into east of the valley and established cities and kingdoms as early as the Mahabharat period. In the process of these two immigrations, a significant fact which took place about Assam is the fusion of Aryan and Mongolian traits leading to the present Assamese culture.

The history of the region commences roughly with the early centuries of the Christian era. From about A. D. 400 to the beginning of the 13th century several dynasties ruled over the region, the earliest of them being the *Varman* dynasty which had its sway for nearly four hundred years. During the reign of Kumar Bhaskarvarman of the *Varman* dynasty in the 7th century, Huen-Tsang came to Assam and recorded about the prosperous condition of the region. Nothing very outstanding appears to have happened for centuries after Bhaskarvarman till the advent of the *Ahoms* in about A. D. 1228. By 15th century, we find two powerful kingdoms in the eastern and western parts of the region, namely the *Ahom* kingdom and the *Koch* kingdom. Prosperity of the region through establishment of townships, construction of communication links and patronisation of religion, art and learning took place significantly during the reign of the *Ahom* and *Koch* kings, though the real development of the valley and utilisation of natural resources were initiated in the 19th century by the Britishers.

Coming to the geographical history of the area, it may be mentioned that throughout the Brahmaputra valley there were a series of raised roadways on both the banks of the Brahmaputra connecting old-time centres of population and industry which were established by the very early rulers. The most remarkable of these ancient roadways is the *Gosain-Kamala Ali* which was made in very ancient times by either the first Hindu conquerors or their *Koch* successors, to connect the old capital of Kamatapur (Cooch Behar) with the Chutiya cities around Sadiya and venerable shrines in the eastern corner of the valley. This road was further raised and improved by Naranarayan, the *Koch* ruler, in A. D. 1332, into a fine causeway for 340 miles of its length to a fort built by him at Narayanpur.³ On the southern side of the river Brahmaputra there were more of these big roadways each retaining its old-time name, and in many parts they are still being used. These roads were mostly constructed after the 11th century by old Kachari rulers and their *Ahom* successors. It is recorded that the region was

thickly populated at that time and there was constant cultural exchange between the people in the east and the west of the valley which necessitated the construction of parallel thoroughfares on both the sides of the river. However, the populous region of Assam valley of the early period went into deterioration due to a series of wars between rulers of small kingdoms in the valley during the period from 11th century to the early Ahom period. The population declined so sharply that it was impossible to recover the old highways and to reclaim the large areas of fertile cultivated lands from encroachment of dense jungles.

The ancient cities which are mentioned in literature and grants are Pragjyotishpur (present Gauhati), Hadappeswar, Durjaya, Kamrupnagar, Sonitpur (present Tezpur), Kundil (near Sadiya) situated on the bank of the river Brahmaputra. All these cities were well fortified. The temple-towns were Hajo (Apurnarbhava), Deopani, Numaligarh, Kamakhya, Tukreshwari, Dudhnath, Surjyapahar and Dimapur. The latter named was better known as the ancient Kachari capital with beautiful structures of buildings, embankments and tanks.

Very little development of the region could be possible during the early period of the Ahoms due to their constant warfare with the local kings, particularly with the Kochas, Kacharis and Chutiyas. A few fort-towns were established by them in the eastern part of the valley, viz. Dibrugarh, Jaipur, Garhgaon, Dergaon etc. However, during the 16th and 17th centuries the Ahom kings, owing to their supremacy after they occupied the entire region from Goalpara to Sibsagar, extended their cultural ties with Bengal and other areas in the Ganga valley and patronised art, literature and the Hindu religion. It is during this period that many towns were established, temples, roads and embankments were raised and ponds dug out. The valley became once again prosperous. Cities of this time were Charaideo, Garhgaon, Rangpur, Dibrugarh, Gauhati, Nowgong, Tezpur etc. On the other hand, a few prosperous towns like Dimapur, Narainpur, Bengmara (present Tinsukia) and Rangagora were destroyed by them

during the wars with the local kings and chieftains. Among roads constructed by them, the Dhodar Ali running from Nagura near Golaghat through Titabar, Charaideo and Jorhat to Tipam on the Burhi Dihing river, the Garh Ali and its continuation in the Seoni Ali and Bogota Ali starting from about the junction of the Koliani and the Dhansiri rivers and running more or less parallel with and north of the Dhodar Ali through Jorhat, Rangpur, Garhgaon to Rangagora on the Burhi Dihing river and the Rajgarh Ali in the southeastern part of the valley running from the border of the Sibsagar district through Jaipur forests, are the most important ones. Many palaces and temples were erected by them in the 17th and 18th centuries. The *Sivadol* (Siva Temple), *Devidol*, *Vishnudol*, *Rangghar* (amphitheatre), *Karengghar* (Palace) at Sibsagar and Garhgaon are worth noting.

But from the later part of the 18th century, the Ahom kingdom was greatly weakened due to internal strife and subsequent invasion and tyranny of the Burmese. As a result, the entire valley and its adjacent areas underwent a regressive phase of development leading to unthinkable depopulation of settlements and encroachment of roads and fertile cultivated lands by dense jungles. Further, the region was subjected to "the turbulent ruffianism of the great bazars in Bengal, with disbanded soldiery and fighting fanatics, who pillaged villages and laid waste the fields, reducing the country to ruin".⁴ The gravity of the situation can be judged from the statement of Captain Welsh on Gauhati town in 1792 as compared to that of Mr. MacDonald after a hundred years quoted by Colonel Shakespear.⁵ Captain Welsh "found it a populous and large city on both banks of the Brahmaputra river with extensive commerce. A rampart along the river-front mounted 113 cannons, while in the centre is a citadel—a large oblong enclosure with brick walls and surrounded by a wet ditch". Mr. MacDonald, about a hundred years later in his book on Kamrup writes thus of the same place: "Of the former glories of Gauhati whether under Hindu, Ahom or Burmese rule, the only relics which remain are the mounds and extensive lines of once

brick fortifications, which lie scattered about the neighbourhood and the Brahmaputra bank. Gateways existing at the end of the 18th century have now entirely vanished. A large portion of the soil in the surrounding cultivated fields is composed of brick dust, mortar, and broken pottery; while carved stones and beautifully finished slabs, the remains of once noble temples, are often found beneath the surface. The numerous large tanks attesting the command of unlimited labour possessed by ancient rulers are now choked up with weeds and jungles”.

The whole Assam valley came under British rule by 1842 and an atmosphere of security in the region was restored which in fact came into effect after the treaty of Yandaboo in 1826 between the Burmese and the British when the former renounced all claims on Assam. The British were confronted with great administrative difficulties due to absence of proper transport and communication lines and rest-houses in the important centres of the region. It is mentioned by Major J. Butler in 1844 that the river journey from Gauhati to Sadiya by country boat which was the only means of transportation in the valley took six weeks and that the houses whether private or rest-houses were without doors and windows. The first step which brought in a change in the cultural landscape of the valley was through construction of roads joining important administrative centres and building of suitable residential houses of the bungalow type in the important towns. Subsequently, trade and commerce in the region developed through regular steamer services in the Brahmaputra and a number of small townships came up at the *steamer-ferry* points. Further impetus for the growth and development of the valley came from the introduction of tea plantation and discovery of coal in the east and south-east part of the valley during the forties of the 19th century. The transport problem was considerably eased with the building of more roads and especially the construction of railway lines in the eastern sector of the valley during the last part of the 19th century, necessitated by the growth and development of flourishing tea industry. In addition, the discovery of oil in Upper Assam

Valley as early as the sixties of the 19th century and the establishment of timber industry accelerated the development of the region, giving thereby a new dimension to the landscape of the valley. The World War II had also an impact upon the development of transport system and growth of local plywood and other industries due to greater demand of industrial products. The sparsely populated valley became a populated one through the movement of the people from different parts of India, such as from East Bengal as cultivators and retail traders, from Orissa, Bihar and eastern U. P. as tea labourers, colliery workers and wage earners and from Nepal as graziers. Most of the immigrants settled permanently in the valley and got moulded into the local culture. By the end of World War II the region had enough indication of its economic potentiality and attracted enterprising people from different parts of India, particularly from Rajasthan, Bengal, U. P. and Punjab for trade and commerce. Further, the establishment of educational and other social institutions helped the socio-cultural development and urbanization of the region. However, it is an undenyng fact that this region was far backward economically as late as the 1940's and it was only after the Independence that the phase of industrialization, urbanization and socio-economic development as a whole got a real start.

Physical Setting

Physiography

The Assam Valley built mostly by the aggradational work of the Brahmaputra and its tributaries is almost a flat level plain with very little slope from its north-east corner at Sadiya to Dhubri in the west. The general level of the valley ranges from 130 m in the east to 30 m in the west with a fall of about 12 cm per km. Physically the valley is demarcated from its surrounding ranges by the 150 m contour. Geologically the valley is built by the deposition of alluvium, 1500 m thick, upon a sag formed during the period of the rise of the Himalaya. It is very well defined between the Boundary Fault on the north and the Naga thrust (fault) in the south (Fig. 7.2).

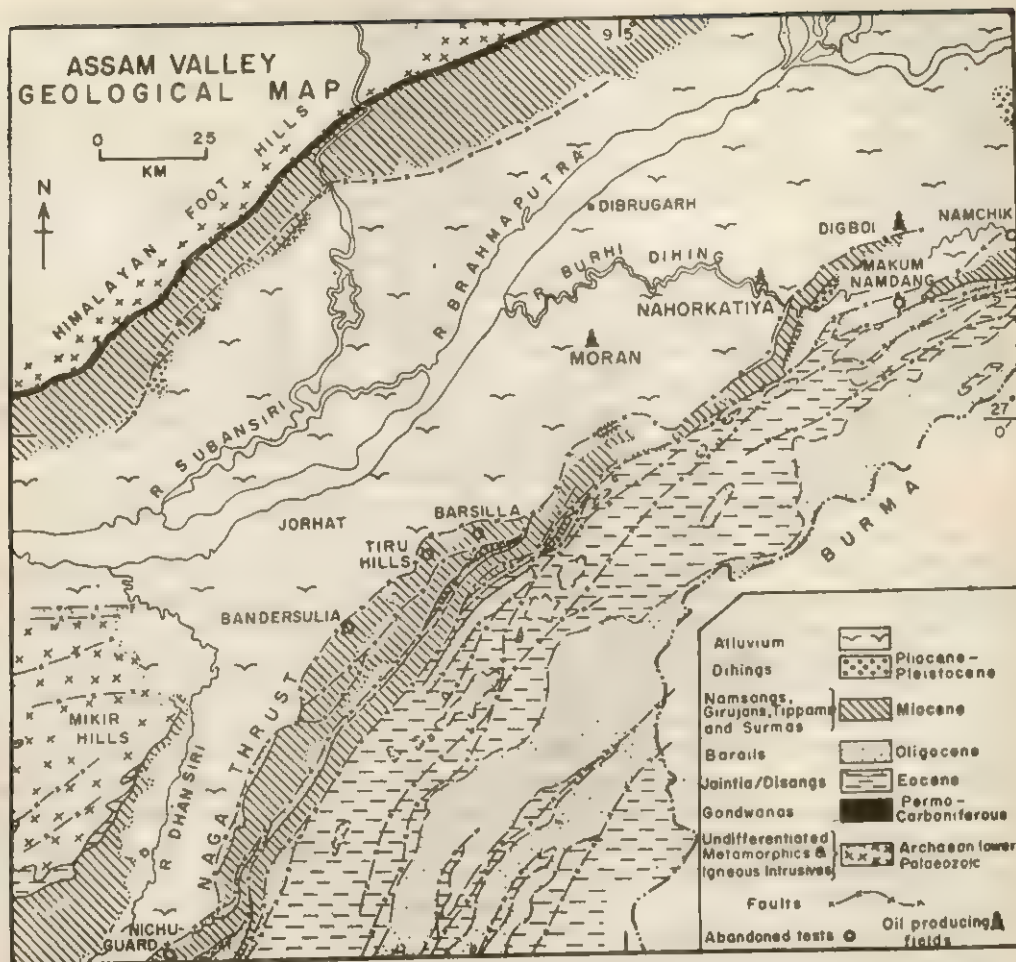


Fig. 7.2

The valley in its northern margin is characterised by a steep slope, having an almost immediate fall from the foothills of the NEFA Himalaya. But the southern margin has a gradual fall from the southern Hill ranges. The valley is fairly wide particularly in Upper Assam, with an average width of 80-100 km, but its width narrows down to about 55 km in its middle part where the river encounters the granite-gneissic projection of the Mikir hills. Beyond this it widens westward, for the plain of the Kapili enjoins the main valley. However, the valley again narrows down to about 65 km on an average when it runs in the gap between the Shillong

plateau and Bhutan Himalaya. In the Gauhati region the river flows so close to the Shillong plateau that it has detached a considerable part of the plateau so much so that granite hillocks project close to its northern bank. The valley again widens to the west until it merges with the North Bengal plain.

Another interesting geomorphological feature of the valley is the presence of a good number of isolated hillocks or monadnocks on both the banks of the river, right from Tezpur and Mikir hills to as far west as Dhubri, detached from the Meghalaya plateau by the degradational work of the river.

Though the valley is mainly of depositional origin, some of its areas adjoining the hills and plateaus, particularly in the south, owe their origin to the headward erosion of its tributaries such as the Dhansiri and the Kapili which have elongated their courses on the east and west of Mikir and Rengma hills in the Sibsagar and Nowgong districts respectively.⁶

There is a marked difference between the physiography of the North and South banks of the river. In the north, the innumerable tributaries running down from the NEFA and Bhutan Himalaya debouch abruptly to the main valley and form a series of alluvial fans which join and obstruct the courses of the tributaries near the foothills. As a result, the tributaries branch out in different channels till they form permanent courses farther down-stream in almost a southerly direction. But, before finding their way into the Brahmaputra they almost run in a parallel course to the main stream as they encounter its levees. Consequently, the tributaries have conspicuous meandering courses leading to the formation of *bills* and ox-bow lakes and huge marshy tracts. It may be noted here that the alluvial fans or cones formed by the coarse alluvial debris in the northern fringe of the valley have given rise to *tarai* or *Semi-tarai* conditions where water trickles down resulting in wet soil and dense forest cover.

The southern part of the valley is less wide and uneven and the tributaries in the south-east are considerably larger. As has been stated earlier, it may be recalled here that the head-streams of the tributaries, the Dhansiri and the Kapili, have by their headward erosion almost isolated the Mikir and Rengma hills from the main mass of the Meghalaya plateau. In the western section of this part the valley is very narrow with small tributaries which run in less meandering courses. But meandering in the eastern part of the southern section of the valley is conspicuous and there are good number of *bills* and ox-bow lakes.

A significant physical characteristic of the Brahmaputra is that the river itself is highly braided necessarily due to its low gradient. As a

result, there are innumerable riverain islands. Majuli (929 km²) is the largest river island in the world (Fig. 7.3).

Drainage

In the drainage system of Assam the Brahmaputra has the most dominant control offering a unique example when considered along with the other large rivers of India.⁷ The upper course of the Brahmaputra lies in Tibet where it is known as the Tsangpo. It rises in the Kailas range at an elevation of about 5150 m.⁸ The river is called the Dihang when it enters the Siang Division of NEFA in a south-westerly course. At a point near Sadiya it is joined by the Dibang from the north and the Lohit from the east and it is from this point that the waters of the three streams flow as the mighty Brahmaputra (Fig. 7.4).

It runs between sandy banks forming a number of divergent channels which later rejoin the main stream. The important among such divergent channels are the Kherkatiya-Suti opposite Burhidihing-mukh, the Luit-Suti opposite Dhansirimukh and the Kalang in Nowgong which takes off opposite Biswanath of Darang district and traverses the whole of Nowgong district west of that point and rejoins the Brahmaputra at a short distance above Gauhati. The river is heavily laden with silt. Its flow is so sluggish that even the smallest obstruction may lead to form an almond-shaped bank which with the next flood, may be entirely washed away or may grow to form a *char*. Dibrugarh, situated on the sandy bank of the river is almost each year threatened by the danger of erosion during floods. Tezpur, Gauhati, Goalpara and Dhubri are also situated on the banks of the Brahmaputra, but they lie on the outcrop of resistant rocks and, as such, are less vulnerable to the havoc of erosion during annual floods. Beyond Dhubri, the river sweeps southward round the spurs of the Garo hills which stand as the watershed between the Brahmaputra in Assam and the Surma in Sylhet (E. Pakistan). The river then enters into the plains of East Pakistan and joins the Padma, a branch of the Ganga, before emptying into the Bay of Bengal. The river, in the monsoon season, re-

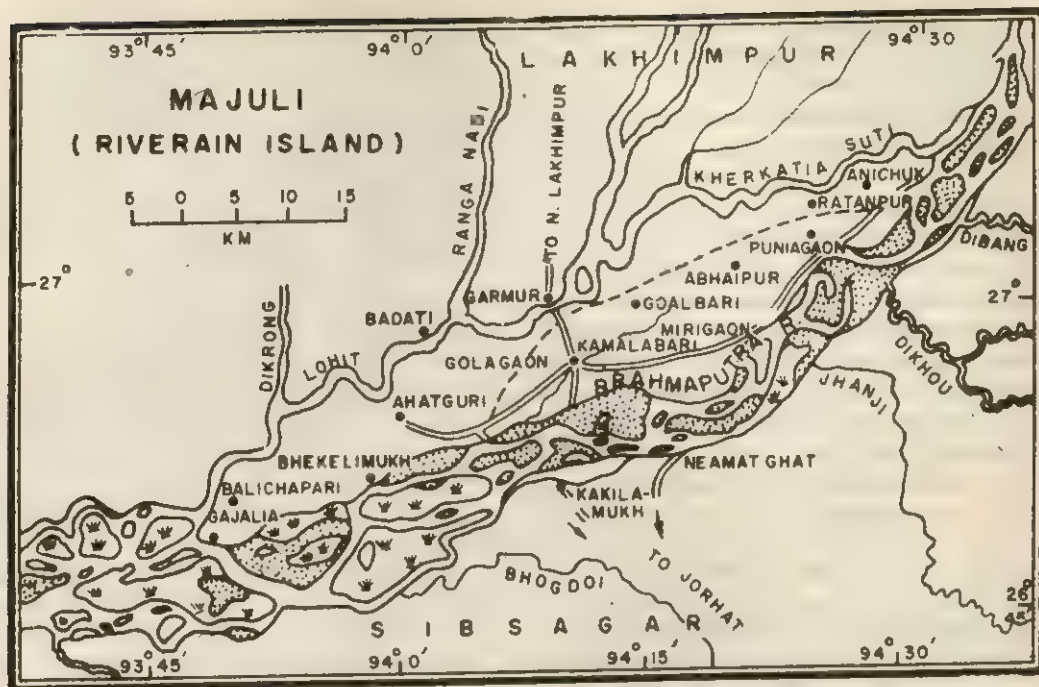


Fig. 7.3

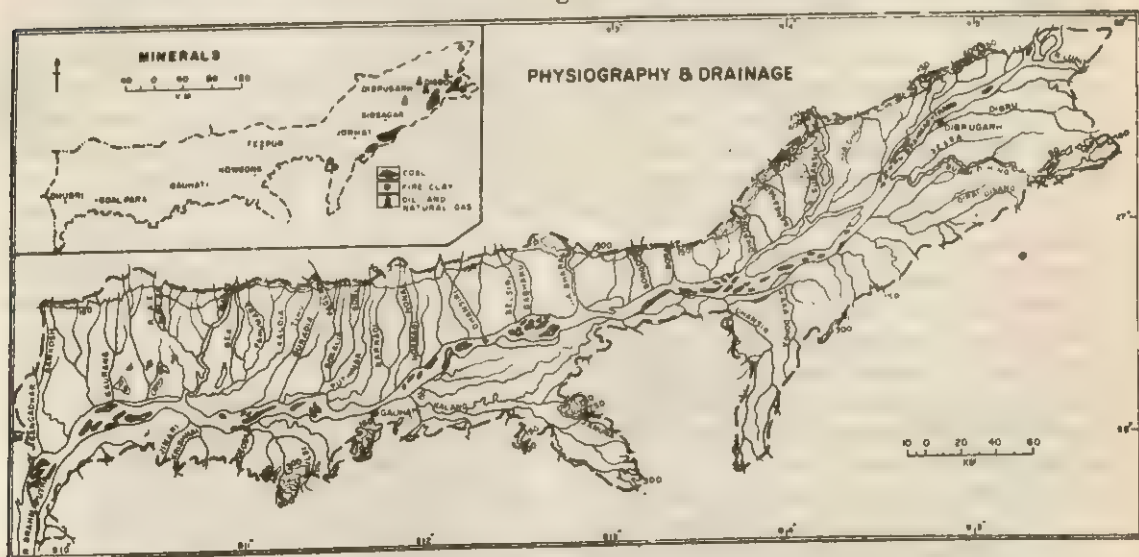


Fig. 7.4

sembles a 'slowly moving lake', in parts being as wide as 8 km from bank to bank.

The Tributaries of the Brahmaputra : The Brahmaputra has more than 35 major tributaries.

Among the right bank tributaries, the Subansiri, Bhareli, Dhansiri, Barnadi, Pagladia, Manas and the Sankosh and the left bank tributaries, the Lohit, Dihang, Noa-Dihing, Burhi-Dihing,

Dihang, Dikhow, Jhau, Diansiri, Kapili, Digaru, Kulsi, Simga, Imram, Dudh nai and the Krishna are the most important.

Many of these tributaries are large rivers with sizeable catchment areas (Manas : 31,000 km², Sankosh : 26,000 km², Lohit : 21,000 km², Dihang : 13,000 km², etc.) and bring in huge amount of water (Lohit 33,800 cusecs; Dihang 27,200 cusecs, Subansiri 16,000 cusecs, etc.) and silt particularly when in spate, with the result that the Brahmaputra is rendered into an enormous "slow moving lake" in the rainy season, the river actually discharges over half a million cusecs of water at Goalpara. Many of the tributaries, like the main river itself, have carved out magnificent gorges, particularly through their Himalayan courses, the Lohit for example, flows through a gorge with a descent of about 160 m in 15 km. Some of the right bank tributaries are also notorious for their frequently changing courses and the Bhareli, the Diansiri, the Barnadi, the Manas etc. are cases in point. The Subansiri (the river of gold) was formerly supposed to be the channel of the Tsangpo in NEFA, till the findings of the Survey of India in 1877 proved it otherwise. It enters the Lakhimpur district breaking through the Great Himalaya and the Mirkhilly through a gorge of great beauty. The Manas (known as Lhobrok or Kuruchu in the upper course) is also of a trans Himalayan origin and flows through a deep gorge in the Great Himalayan range.

Among the left hand tributaries the Lohit, the Dihang, the Buru-Dihang, the Diansiri and the Kapili are the most important. All the left bank tributaries are typical monsoon streams and follow less meandering courses, the Diansiri however is highly meandering. A good number of them are navigable also.

Floods are an annual menace to agriculture and settlement in the valley. The Brahmaputra with its tributaries carries tremendous volume of water and considerable silt discharge during the rains, when the heavy monsoon downpour in their catchment area is supplemented by the melting of ice and snow over their Himalayan sections. As a result, the rivers get choked up

with detritus. Active bank erosion also results in filling in the river beds and thus the water-holding capacities diminish. This is specially significant in case of the giant Bed maputra which raises its bed by heavy silt-discharge and fills it every year by lateral erosion. These hydrological conditions naturally result in the swelling of the rivers causing floods. In addition to these normal processes, natural calamities like the earthquakes sometimes disturb the natural course of the rivers and create additional forces for flooding. Specially, the great earthquake of 1950 has caused a dreadful effect increasing the intensity of flood in the region. The extraordinary shocks of the earthquake caused extensive land-slides in the north-eastern hills and subsequent downpours transported a tremendous volume of detritus into the river beds. This has resulted in shallowing the cross-sectional areas of the Brahmaputra river and its tributaries resulting in spilling over their banks during the rains. Since then, floods have become a common feature in the region. A high water discharge in the Brahmaputra influences the water profile of its tributaries as well. Thus, floods in the tributaries alongwith the main river have become almost an annual occurrence.

The damage due to floods and river erosion since 1950-51 has been quite high and extensive. The average annual loss of property and crops has been of the order of 80 to 100 million rupees. In 1966 the intensity of flood was so high that the area under flood went up to 16,000 km², and the loss of property and crops amounted to over 200 million rupees.

Climate

The climate of the Brahmaputra valley as well as that of the entire Assam is mainly controlled by five factors : (a) the orography, (b) the alternating pressure cells of North West India and the Bay of Bengal, their eastern and north-eastern periodic oscillations, (c) the predominance of maritime tropical air mass (mT), (d) the periodic western disturbances and (e) the local mountain and valley winds.¹⁰

The sub-tropical locational and positional significance with its mountain and plateau girdle,

and an opening to the west are particularly contributive to its climatic character. While the lofty ranges in the north protect the valley from the cold air-mass of the Tibetan region in the winter, they provide conducive topographic condition for heavy forest rain in the valley as they obstruct the warm moist south-west monsoon air-mass and deflect the currents along with descending and adiabatic effect and development of the cumulo nimbus.

It may be noted here that sometime in March-April, when the high pressure area over the land-mass of India starts along with the steepening of the pressure gradient in India and U. P. and that that matter the development of a strong high pressure over North Burma. It is at this time that a strong cold pattern through Assam and Apatani and northern Arunachal Pradesh enters the line of attraction between the two areas which during the pre-monsoon and monsoon periods. This brings a heavy down-pour of rain and a consequent check on the rise of temperature in the summer months.

It will be worth while to mention about the eastward moving steps and troughs that are tending to lower levels moving as the western disturbances and the local phenomena arise over the mountains and valley winds. Katabatic and Anabatic winds which have profound influence on the climate and weather of the valley. The westerly disturbances bring in rain-bearing weather over a greater part of the valley during monsoon. A mild stormy weather and rain-bearing are the normal characteristics of these disturbances.

The weather of the valley varies farly different from that of the Ganga valley due to some local phenomena affecting part and is affecting influence. The mountain and valley winds, compared to the land and sea breeze of the coastal regions, have their effect on moderating the temperature conditions and so such, unlike the Ganga valley, heat waves are rare in summer in the region. Though temperature is moderate, the weather becomes colder as winter and dry heat of the Ganga Plain. The other local phenomena include fog, thunderstorms and dust-raising winds. Prevalence of fog in the valley is a

characteristic feature of weather during winter months. Fog occurs in most places of the valley for a period of more or less and on some places of some days for 70 to 100 days. The prevalence of fog is mainly due to foggy or soft and moisture evaporated from the forest beds and the extensive grassy and swampy of the valley. The prevailing mountain winds tend to concentrate the fog more over the south bank. Thunderstorms are very common features associated with the weather of Arunachal Pradesh due to prolonged onset of the state both from the Monsoon winds and from local sources and the addition of radiated heat from the dry surface over Arunachal with adequate potential energy for the growth of stormy clouds. About 10 to 15 pre-monsoon rains are associated with thunder storms which exceed 100 days a year in the north-east part of the valley (Table I).

TABLE I

Frequency of Thunder days

Along the line		Along the Foot of the Himalayas	
Stations	Number of days	Stations	Number of days
Rupai	80	Marhat	61
Couhali	119	N. Lakhimpur	69
Tropac	100	Paighat	34
Jorhat	63	(N/A)	
Mahanbari	113		

The dust-raising winds are frequent in the valley during the summer of the pre-monsoon season. In a strong wind the high pressure of the Bay of Bengal, over India and western disturbances come along the NECH Himalayas. The high pressure over a strong pressure gradient over the valley pushes and consequently the winds gain speed moving along the foot of the hills and over the surface of the valley. These dust-raising winds come from the west of the valley during the season of western depression.

Lowest recorded minimum temperature in the Arunachal valley is about -10°C in the month of January. In the last few years, it is reported that in the last few years of winter, it will be very high and large amount of snow comes in the pre-monsoon and monsoon

period, and in the prevalence of fog in the winter months (Fig.7.5). Evidently, all these conditions along with the thermo-dynamic influence of orography have developed a climatic distinctiveness for the Assam valley, different from the normal Cwg or humid meso-thermal of the Ganga plain and, as such, the climate of this region may be classified as 'Cwb' or humid meso-thermal Brahmaputra valley type.¹²

Seasons : On the basis of variations of temperature, rainfall and winds, the year in the region may be divided into four distinct seasons : (a) winter, (b) pre-monsoon or summer, (c) Monsoon and (d) Retreating monsoon.

(a) *Winter season* (Dec.-Feb.) : This season is characterised by cool weather and frequent morning fog. Temperature remains well above 12.8°C, the average diurnal range seldom exceeding 5.5°C. January is the coldest month of the season. The total amount of rainfall in this season seldom exceeds 11.4 cm. However, this cool, fair and pleasant weather is interrupted casually by showers associated with western disturbances, which lower the temperature and bring cold

spells. The eastern plain districts are cooler than the western plain districts.

(b) *Pre-monsoon or Summer season* (March-May) : is transitional between relatively dry winter and wet summer, and is characterised by a rapid rise of temperature. As the season advances, the amount and frequency of rainfall increases due to frequent thunder-showers with hail-storms in the afternoon with subsequent decrease in diurnal range of temperature. These thunder-showers are called Nor'westers, locally known as *Bardoichila*. The advance of the premonsoon season is marked progressively by greater number of days, e.g., 6 days in March, 12 days in April and 14 days in May. The total rainfall during this season is 51.87 cm. The average temperature of this season is 23°C with an average diurnal range of about 6.1°C.

(c) *Monsoon season* (June-Sept.) : The prevailing low pressure trough draws in monsoon currents in the valley. In fact, the south-west monsoon wind from the Bay of Bengal is first encountered by the Arakan range of Burma and deflected towards north. After crossing the Sylhet plain

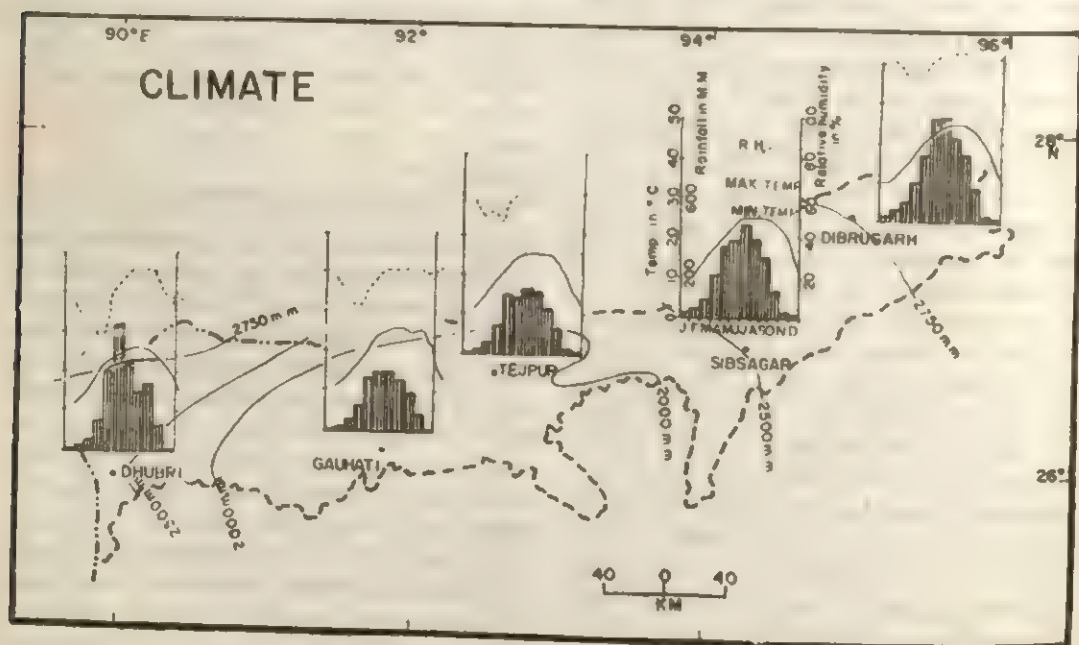


Fig. 7.5

this wind faces the southern flank of the Meghalaya almost at right angles and undergoes forced lifting over the highland. Some moisture of the wind is released through condensation and precipitation, and the instability of the air is enhanced by the added latent heat of condensation. The wind gains momentum, crosses the hills and rushes towards north-east. Thermodynamic enhancement of momentum causes the air to rise further up to a height between 2 and 3 km above the ground level. Hence, at the lower level, due to raised pressure gradient, a local low pressure centre is created on the leeward side of the Khasi and Garo hills. This 'low' which is normally located southwest of the Mikir hills in the pre-monsoon period, moves fast to the north-east of the valley under the influence of frictional drag of the south-west wind. The 'low' that develops on the leeward side of the Khasi-Jaintia hills causes local convergence during the early monsoon season.¹³

This season in the valley is characterised by very high humidity, weak variable surface winds and cloudy sky. The weather becomes sultry and oppressive due to high humidity, although the incessant rains cause moderating effect on the temperature. The average temperature during this season is 27.17°C with an average diurnal range of over 6°C. August is the hottest month, not only in this season but in the whole year. The total amount of rainfall is very high and there are about 18-20 rainy days each in June, July and August and about 14 days in September. As usual, rain in each month is associated with thunderstorms for about 8 to 12 days.

(d) *Retreating Monsoon season* (October-November) : Towards the end of September the monsoon weakens with an abrupt retreat followed by fair weather. With the advance of the season the temperature falls and morning mist and fog appear. However, the diurnal range of temperature increases and it varies from 2.8°C to 5.6°C. The winds become northerly in November and are fed by north-westerly winds from the Ganga Valley. The rainfall does not exceed 15.2 cm in the valley and the rainy days are fewer, e.g. 7 to 9 days in October and 1 to 3 days in

November. The Lakhimpur and Sibsagar districts in the eastern part of the valley experience longer rainy or cloudy days, but the average rainfall per rainy day rarely exceeds 2 cm. This season with a stable weather is delightful period of the year.

It may be mentioned here that although there is a broad climatic homogeneity throughout the valley, yet there are considerable local variations in rainfall, range of temperature and other phenomena like mist and fog. The eastern part of the valley experiences high rainfall and low range of temperature whereas the western part receives less rain and is characterised by a relatively higher range of temperature. The central part of the valley assumes transitional character with rain-shadow effect in the area west of the Mikir hills.

Soil

The soil in the Assam Valley is broadly alluvial in character. In the fringes of the valley, particularly in Kamrup, Lakhimpur, Nowgong and Sibsagar districts, there are limited areas with lateritic soil (Fig. 7.6).

The new alluvial soils are mostly found in the riparian tracts of the valley and are subject to annual floods, and renewal. They are suitable for the cultivation of rice, jute, pulses, mustard, potato and vegetables. They are less acidic and are often neutral and even alkaline (pH 5.5) to slightly alkaline. They are rich in 'available phosphate', potash and exchangeable calcium. In texture they are usually sandy, silty or clayey loam. The percentages of nitrogen and organic matter are satisfactory for agricultural purposes and are particularly high in lowlying areas.¹⁴

The old alluvial soils are found above the annual flood level. These soils are more acidic and are usually deficient in 'available phosphate' with low to medium proportion of potash. In texture the soils vary from sandy to clayey loam with high to low content of nitrogen. The pH value is low (4.2 to 5.5) with very low 'exchangeable calcium'. The acidic character of these soils makes them very suitable for tea plantation, particularly in the Upper Assam Valley. The deficiency of phosphorus and nitrogen is met with by the supply of fertilizers. These are also suitable for

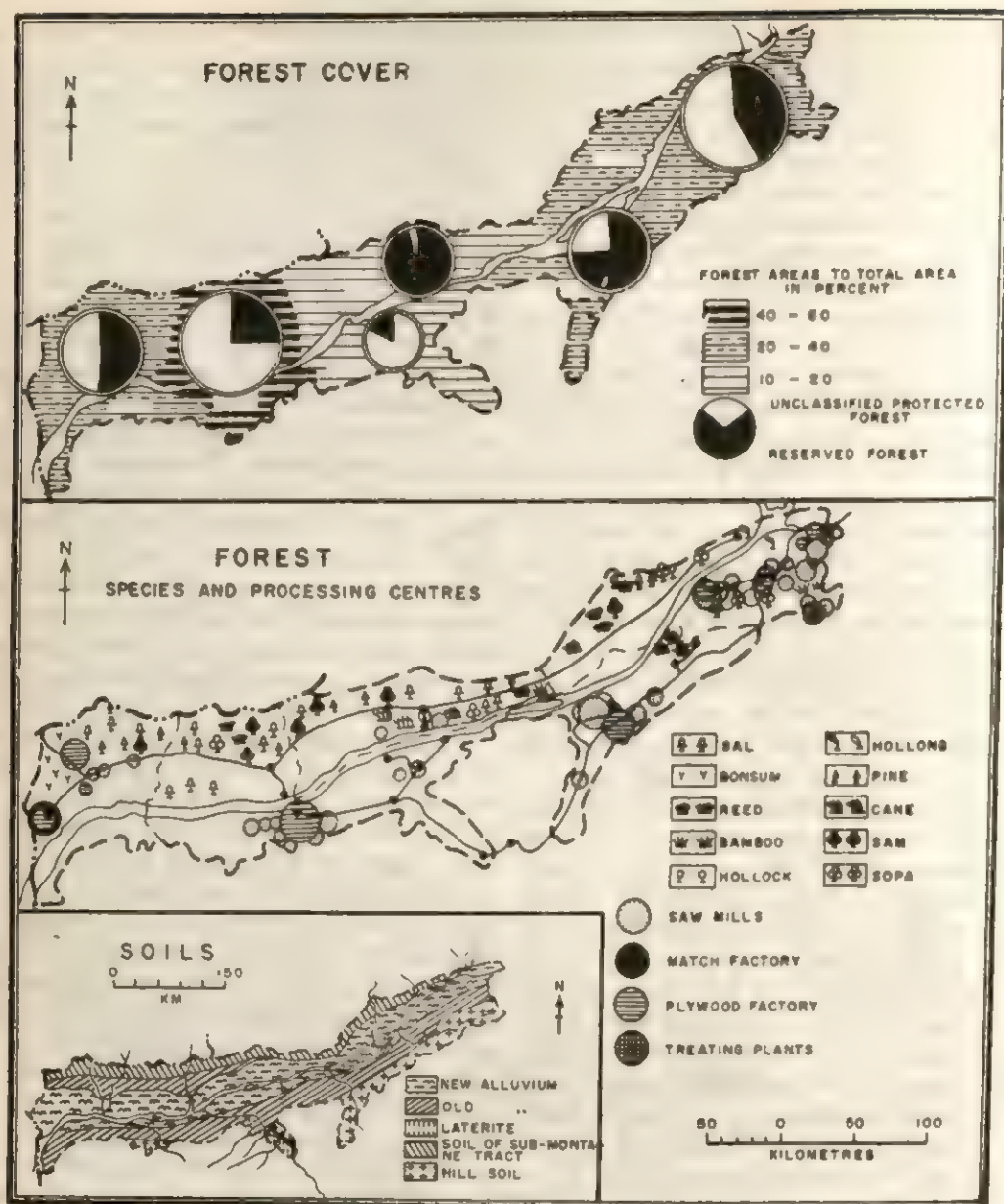


Fig. 7.6

sugarcane, fruits, rice and vegetables but not for pulses and mustard.

The lateritic soils which occupy small areas in the valley are highly leached soils, poor in plant nutrients and are generally of limited agricultural value. They are workable for agricultural use after rains, but harden on drying.

It may be mentioned here that soils in the northern fringe of the valley, particularly in Goalpara, Kamrup and parts of Darrang districts are of coarse alluvium formed by the debris deposited by the debouching streams in the *tarai* tract with dense vegetation, since the soil is wet.

Minerals

Except oil and coal the region has practically no mineral resources worth the name. The Upper Assam Valley has a large reserve of oil which has been estimated at 45 million tons constituting nearly 50 per cent of the country's total known reserves. The Dibrugarh subdivision of Lakhimpur district contributes, by its oil and coal deposits, 90 per cent of the net income from mining in Assam. The oil fields lie in Upper Assam around Digboi, Naharkatiya, Mo-

ran, Rudrasagar, Lakwa, Geleky and Teok, and are geologically confined to the Tertiary strata, mainly on the widespread unconformity near the top of the Oligocenes, particularly on the anticlines as is evident from the section (Fig. 7.7). Digboi is surrounded by a semicircle of high mountains. Here the oil occurs in a long narrow faulted anticline. The fault bounding the structures on the north is the Naga thrust; Digboi is a local culmination at the north-eastern end of a long line of uplift known as Jaipur anti-

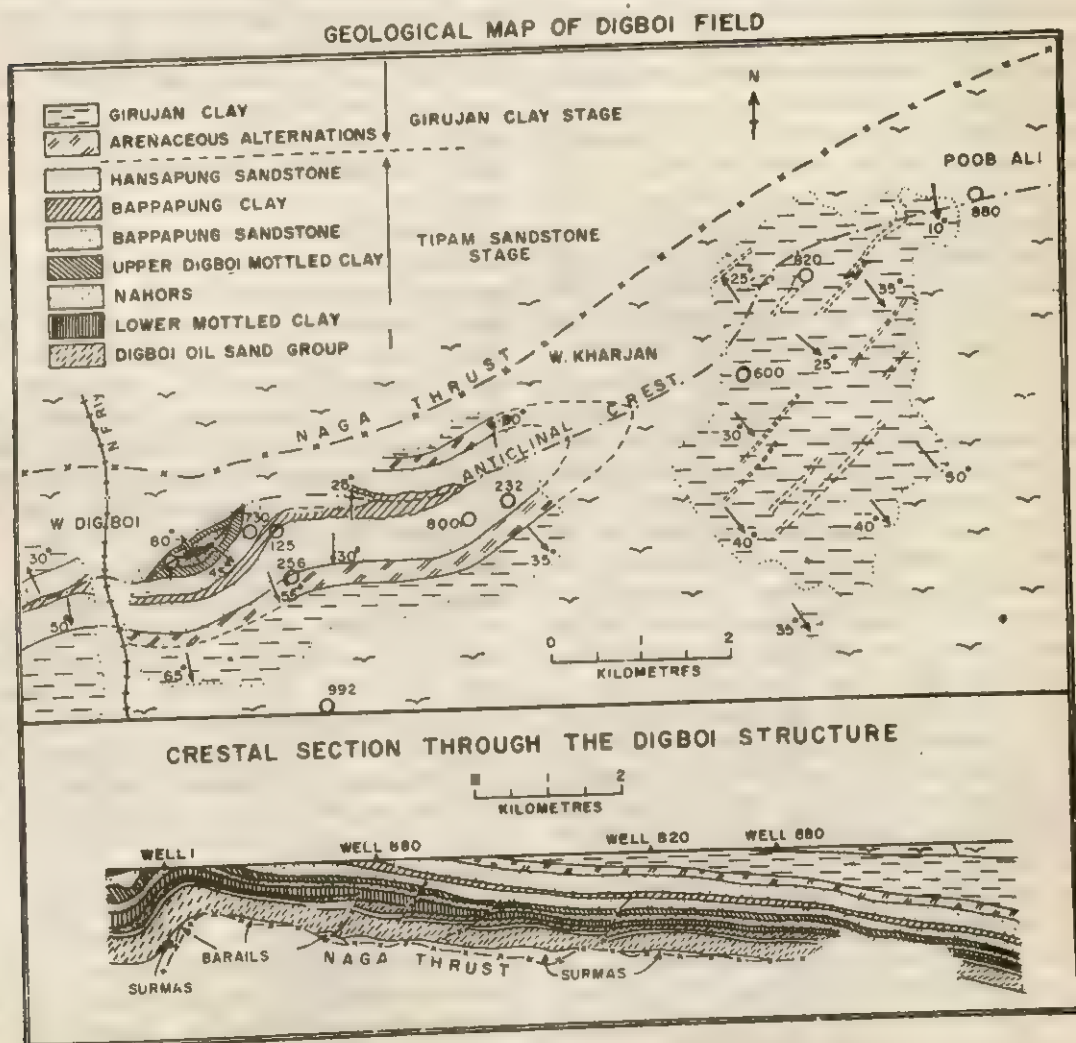


Fig. 7.7

cline, sharply folded in parts and markedly asymmetrical. Folds are tighter westward (Fig. 7.7). As many as 24 productive sands occurring at intervals over a stratigraphic range of about 1,100 m.¹⁵ are there, all belonging to the Tipam Sandstone stage and the Surma series. About 730 m of strata outcrop along the pitches but 430 m is still concealed. The former accounts for 60% of the output while the latter for about 40%.

Naharkatiya-Hugrijan oil fields are located in the valley of the Burhi Dihing about 40 km south west of Digboi. The structural location of the oil is a bit different in Naharkatiya-Hugrijan fields where the folds are much more gentler and broken up by faults, some of which have acted as barriers to fluid movements. Oil-bearing strata are the same here also.

The oil fields in the valley are under cover of a thick mantle of alluvium which conceals the oil-bearing rocks. The oil is found at depths ranging from 270 m to 4,300 m. In addition to this, a large number of new oil wells are associated with natural gas, while some of the wells produce only gas. In Naharkatiya and Moran fields alone, a reserve of 1,140,000 million cubic feet of natural gas is estimated and daily output is calculated at 100 million cubic feet. It is notable that the natural gas is being utilized for producing electric power near Dhuliajan.

The coal fields which are of Tertiary origin are concentrated in the south-eastern part of the valley. The major coal fields are Ledo-Makum, Jaipur-Dilli and Nazira. The estimated reserves of workable coal in the two major coal-bearing areas of Makum and Jaipur are 310,000,000 tons and 20,000,000 tons respectively.¹⁶ However, the production of coal has been declining from 577,000 tons in 1963 to 541,000 tons in 1965.¹⁷ The coal of the region contains remarkably low ash but high sulphur. These are consumed at present by railways, iron and brass foundries, brick kilns, inland water steamer services, tea gardens and other industries in addition to household consumption. Apart from their general use they are very suitable for manufacture of coal-distillation products.

The fire clay is another important mineral of the region. It is primarily concentrated in the coal seams of Upper Assam. Recently banded magnetite-quartzites have also been discovered in Chandardonga hill in Goalpara and Hahim along the Kamrup-Meghalaya border.¹⁸

Vegetation

The vegetation of the region is predominantly characterised by dense mixed semi-evergreen, evergreen and wet deciduous types owing mainly to the impact of heavy monsoonal rainfall, effective temperature and thick fertile soil cover in the valley. The vegetation in the valley may be classified as follows : (a) Tropical evergreen and semi-evergreen, (b) *Sal*, (c) Riverine forests, (d) Mixed deciduous, (e) Savannah, and (f) Bamboo and canes and miscellaneous varieties (Fig. 7.6).

(a) *Tropical Evergreen and Semi-evergreen Forests* are found in the easternmost part of the valley, particularly in Lakhimpur district and partly in Sibsagar district with an imposing, dense, luxuriant growth, a characteristic vegetation of high rainfall regions. Among the evergreens, the most common trees are *Hollong*, *Nabor* and *Mekai* found mainly in the south eastern part. The *Hollong* with a girth of 6 m or more and a height of 45 m or more has a clear cylindrical bole going up to almost the top and is undoubtedly the most majestic tree which occurs usually gregariously. The *Hollong* and the *Mekai* provide raw materials for plywood mills in the Upper Assam Valley. Other notable trees mixed in Nabor-Hollong forests are *Amari*, *Sam*, *Jutuli*, *Borpat*, *Gamari*, *Kadam*, *Hollock*, *Urium* confined to swampy area; *Gandsarai*, *Dhuna*, (the Dhuna of commerce is its gum), *Khokan*, *Sopa*, *Silikha* and *Bhomora*. *Marbal* is another tree of this group, present conspicuously in these forests at a lower level.¹⁹

In the extreme eastern part of the north bank of the Brahmaputra there is another species of evergreen type, known as *Sia-Nabor* which comprises about 70% of the trees in that area. In this part there are many other important evergreen and semi-evergreen species such as *Agaru* (source of 'Agar' perfume), *Amari*, *Sam*, *Jutuli*, *Urium*, *Dhuna*, *Tita champa*, *Silikha* and *Gamari*.

The semi-evergreen forests are more widespread in the valley than others, though species vary from one locality to another. These occur predominantly in the districts of Sibsagar and Darrang and within the vicinity of streams and other moist areas, particularly in the *tarai* region of Goalpara district. These forests are not so imposing and dense as the evergreen forests. The *Bonsum* and *Amari* trees are the most important and occur predominantly among this type of forests. Other important species both ever-green and semi-evergreen, which are interspersed, are *Sam*, *Dhup*, *Outenga*, *Guti-jam*, *Nabor*, *Sopa*, *Som* (the *muga* silk tree), *Gamari*, *Hollock* and *Silikha*.

(b) *Sal* : Large areas in the districts of Kamrup and Goalpara and the western part of the Nowgong district are covered by *Sal* trees. This species has a very high commercial value owing to its long cylindrical bole and absence of middle storey. The most important *Sal* tract of the valley is in the Mechpara wards estate of Goalpara district covering 205 km². The south-western section of the Darrang district also contains a limited area of *sal* trees¹⁹. The important associated species of *sal* are *Makri-Sal*, an important plywood species of Lower Assam, *Sida* and *Sam*.

(c) *Riverine* : Forests containing *Khair* and *Sissoo* occur mainly along the large river banks from the Sankosh in the west through Goalpara and Kamrup to the eastern boundary of the Darrang district in the northern fringe of the

valley bordering the Bhutan foothills. Another type of riverine deciduous forests occurs all over Assam in those alluvial tracts which are inundated by streams in the monsoon period. This type comprise mainly the *Simul*, *Koroi* and *Kadam*. The riverine forests are very open and hence much grass is present. *Sou-kher*, the best thatching grass of Assam, occurs in these forest tracts.

(d) *Mixed Deciduous* type of forest occurs mostly in the Lower Brahmaputra valley in the transitional areas between highland and Savannah forest and *sal* forests in the plains. The main species of this group are *Odal*, *Simul*, *Bajau*, *Sidha*, *Gareya arborea*, *Parviflora makri-Sal*. The ground of such forests is often covered by thatch grass and reeds.

(e) *Savannah* type occurs in the well drained higher areas adjoining the villages. The species found in these areas are *Cayera arborea*, *Wrightia tomomiosa*, *Zizyphus* and *Randia*. '*Rata*', a kind of *Imperata arundinacea* is found extensively in these areas. Lowland savannah containing *Saccharum spontanium* as the main grass is found on the banks of rivers and streams which are flooded during the rains.

(f) *Bamboo, cane and miscellaneous varieties* : In addition to the above mentioned vegetations the valley is rich in minor species, such as bamboo, cane and reeds which are of considerable economic importance. Bamboo occurs throughout the valley, but is more concentrated in Upper Assam. There are many species of bamboo among which *Jati*, *Bhaluka*, *Makal* and *Kotoba*

TABLE 2
Area under forests in the Assam Valley, 1964-65
(In acres)

District	Reserved	Protected	Unclassified	Total
Goalpara	5,80,173	...	4,27,232	10,07,405
Kamrup	2,77,120	66	8,24,678	10,01,864
Nowgong	2,39,789	...	50,688	2,90,477
Darrang	3,86,349	...	18,432	4,04,781
Sibsagar	4,90,611	...	1,38,636	6,29,247
Lakhimpur	4,87,219	...	4,54,176	9,41,395
Assam Valley	24,61,261	66	19,13,842	43,75,169

Source : Forest Department, Assam.

are the most important. Canes occur in swampy areas all over the valley but they are found in plenty as large cane-brakes in the evergreen and semi-evergreen forests of Upper Assam and in the Darrang district.

There are important species of grass and reeds such as *Kher*, *Ekara* and *Kahua* along the banks of the rivers, particularly in the riverine and savannah tracts of the valley.

The total forest area in the region is 4,375,169 acres out of which 56.25% is under reserve forests and 43.75 percent under unclassified forests. The table 2 gives the districtwise breakup of different forest areas in the region.

It is clear that the Goalpara district has not only the highest acreage of reserved forests containing the most valuable timber and veneer species but also the second highest total acreage. Though the Kamrup district stands first in the total acreage of forests, its position is less significant in respect of reserved forests. Thus, the Sibsagar district though stands fourth in total acreage, its position in respect of the valuable reserved forests comes next to Goalpara. The position of Lakhimpur district in both the total acreage and reserved forests is third having the most valuable commercially exploitable timber and veneer species (Fig. 7.6).

• Wild life

Another important resource in the forests of the region is the wild life. It comprises of the important species of mammals, birds, reptiles and fishes. The most important among the mammals are the elephants, rhinoceros, wild bovines or bison and deer. The one-horned rhino of the valley is an important foreign exchange earner, being a rare species and almost extinct elsewhere. The elephants are also important particularly as means of transport in difficult terrain and as draught animals in the lumbering industry. The richness and variety of wild life of the region in the reed jungles provide the most ideal location of the game sanctuaries at Kaziranga in Upper Assam and at Manas in Lower Assam. The Kaziranga Game Sanctuary has been developed as a National Park which enjoys international status as a tourist centre.

The Physical Resource Base

Eccentrically but strategically located in the north-eastern part of India, the Assam Valley, mostly composed of rich alluvial detritus and drained by the Brahmaputra and its numerous perennial tributaries, humid monsoonal climate, rich soils and an extensive forest cover, is a land of promise, providing an extensive area for pioneer settlements and agricultural landuse. Although the southern region is almost in the rain-shadow zone, particularly in the lee of the Meghalaya, the rainfall is high enough to obviate irrigation for general cropping all the year round, with the aid of some small scale *bund* or gravity irrigation for ensuring better yields. The region has sufficient water resources for such type of irrigation with little capital investment. Extensive areas are covered with *sal* and other stands of great commercial and industrial value, while rich and extensive cane, bamboo, reed and general jungles in the swamps and *bils* are also important for checking soil erosion as well as meeting numerous needs of the woodcraft and various other industries. The valley is as rich in its wild life resources also. The vast swamps and reed jungles provide almost ideal ecological setting for the so prized one-horn rhino and also the elephant, the latter being used for lumbering. The region is also one of the major sources of fresh water fish in its vast and perennial rivers, swamps, marshes and *bils*; it is an important base for part time occupation of the rural folk and enters as a common item in the Assamese meal.

Although the valley is not rich in overall mineral endowment, it has the strategic oil and gas deposits, the only area of this source till recently in India; and some soft Tertiary coal deposits, scattered but rather extensive, which already serves to feed a number of industrial, transport and domestic consumers and may also give rise to other industries. Fire clay deposits are also important. Over it all, the balance of power resources is rendered more promising with the vast hydro-power potentials, with which the whole flank of the Brahmaputra river valley is endowed within its almost ideal physical conditions, reaching at many points with the conjunc-

tion of promising terrain and huge perennial water flow. In essence the land and water resources of the valley promise an extensive though not so broad based-resource base for economic development.

Cultural Setting

Population

The Assam Valley with a population of 9,179,127 (1961) distributed over an area of 56,579 km² stands conspicuously on the population map of Assam having a density of 162 persons per km² in contrast to a meagre 22 per km² of the neighbouring hilly areas. The urban population comprising only 7.4 per cent of the total population of the region depicts undoubtedly an unbalanced rural-urban ratio (25 : 2), as also in the major part of the Great Plains—a serious problem in regional development in view of the increasing pressure on agricultural land because the population of the valley is overwhelmingly agrarian.

The population of the valley was rather small in the first half of the last century, as can be judged from the estimated population of 799,519 in 1835.²⁰ The increase in population in the valley, though spectacular since 1901, has been steady in terms of decennial percentage variation with 18.68 in 1901 to 19.08 in 1951 (Table 3). But the increase is very much spectacular during 1951-1961, for the percentage variation has suddenly risen from 19.08 to 36.04 which is incidentally the highest in the country. Thus, the overall growth

of population during the last sixty years is very significant. In 1901 the valley had a total population of 2,618,566 which increased to 9,179,127 (1961). Thus the overall increase during this period is 250.5 percent. This remarkable continuous growth is mainly due to a continuous influx of population from other parts of India since the turn of the century.²¹ Such abnormal growth of population in such an underdeveloped region is really alarming. Many factors are responsible for such a situation. The important among them, besides the natural increase, are the Pakistani immigration and infiltration, and the migration of the Nepali graziers and the influx of population from other parts of India owing to the realization of resource potentialities and their subsequent exploitation in the region.

The distribution of population in the valley as a whole is rather homogeneous, except in the foot-hill regions in the north and the hilly tracts in the south and south-east. However, there is a considerable local variation in the density of population from one part to the other within the valley with as high as 212 persons per km² in the central part (Nowgong district) and as low as 136 persons per km² along the north bank as against 162 for the valley as a whole (Fig. 7.8).

The density in the Lower Assam Valley is relatively higher than the Upper Assam Valley. This may partly be attributed to the early occupation of the area, being located in close proximity to the very densely populated region of Bengal and availability of larger tracts of culti-

TABLE 3
Percentage variation in population in the Assam Valley (1901-61)

Year	Population	Decade Variation	Percentage Variation	Density/Km ²
1901	2,618,566	...	...	47
1911	3,107,755	+ 489,189	+ 18.68	55
1921	3,856,507	+ 748,752	+ 24.09	69
1931	4,723,833	+ 867,326	+ 22.49	84
1941	5,666,248	+ 942,415	+ 19.95	101
1951	6,747,551	+1,081,303	+ 19.08	120
1961	9,179,127	+2,431,576	+ 36.04	162

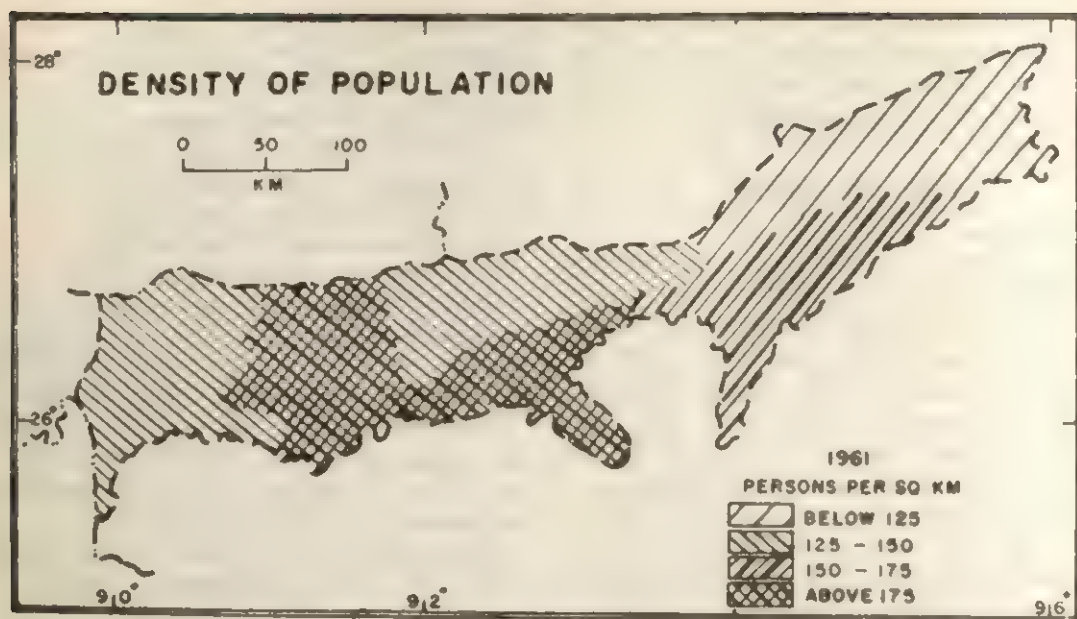


Fig. 7.8

vable areas for the agricultural immigrants, particularly from the Mymensingh district (E. Pakistan). The high density in the Nowgong district is due, in addition to the above factors, to the absence of hilly tracts and permanent settling of a large number of Pakistani infiltrators, particularly those who came in the last decade, 1951-61. The low population concentration as well as low density in the North Bank tract is due to a larger tract being under foot-hill region and annual inundation of the agricultural tracts by the innumerable tributaries of the Brahmaputra.

It is worthwhile to mention here that the general density figures depict rather a less crowding of population in the valley, when compared to other valley areas in India, particularly the Lower and Middle Ganga Plain. But taking into consideration the large tracts occupied by forests, waterbodies including permanent marshes and swamps and extensive plantation areas, the region in fact may be regarded as one of the overcrowded areas in India with a very high agricultural density (about 1,450 per km²). The overcrowding of the rural areas may be judged from the following density figures of the thanas distributed in different parts of the Valley (Table 4).

The urban growth in the region was rather very slow up to the late forties with an urban population of 2.37% in 1901 and 4.09% in 1951, mainly due to the retarded economy of the region. However, a spectacular increase in urban population has taken place since 1951 particularly because of the expansion of employment scope in larger towns of the valley based on accelerated rate of industrialisation, influx of immigrants, migration of rural population to the towns, development of trade and commerce and a relatively higher level of sociocultural uplift of people. The extension of urban functions and creation of new townships in other rural areas are also, to a great extent, responsible for increase in the number of urban population in the region²³. The rural population consequently, and naturally, has grown slower than the urban population, as can be seen from the table 5.

The male population in the region was 4,925,762 in 1961 and the female, 4,253,365. This gives a low sex ratio (863) which is due to the fact that a large section of the migrants do not bring their wives with them, and also because of the higher mortality rate among women than men, parti-

TABLE 4

District	Thana	sq. mile/ Area in/km ²	sq. mile/ Density per/km ²
Goalpara	Mankachar	61.4 (158.9)	885 (342)
	Dhubri	164.2 (425.0)	872 (337)
Kamrup	Nalabari	196.0 (507.0)	991 (383)
	Patacharkuchi	230 (595.4)	545 (211)
	Kamalpur	158 (409.0)	702 (271)
	Baghbor	241 (623.9)	557 (215)
	Dhing	78.5 (203.2)	967 (374)
Nowgong	Nowgong	143 (370.2)	1,123 (434)
	Rpahihat	167 (432.3)	930 (359)
	Jorhat	311 (805.1)	826 (319)
Sibsagar	Nazira	207 (535.9)	612 (236)

TABLE 5

Percentage variation of Urban, Rural and Total Population

	1941-1951			1951-1961		
	Urban	Rural	Total	Urban	Rural	Total
Lakhimpur	+ 59.45	+ 16.20	+ 17.94	+ 146.20	+ 32.65	+ 38.85
Sibsagar	+ 39.78	+ 15.87	+ 16.51	+ 95.08	+ 22.06	+ 24.43
Nowgong	+ 158.58	+ 33.40	+ 36.65	+ 86.55	+ 33.92	+ 36.51
Darrang	+ 60.68	+ 23.55	+ 24.25	+ 124.01	+ 37.54	+ 39.64
Kamrup	+ 33.51	+ 17.18	+ 17.89	+ 197.10	+ 30.11	+ 38.39
Goalpara	+ 54.62	+ 8.04	+ 9.25	+ 151.40	+ 35.06	+ 39.32
Assam Valley			+ 19.08			+ 36.04

cularly in lower age group, as usual in India. Further, there is a greater imbalance between the sex ratio in rural and urban population (Table 6). This low figure for urban female population is undoubtedly due to the fact that there has been a large influx of people to the growing towns of the region from outside Assam and in most cases people, the males, have not brought with them

their female folk, thus giving an even lower sex ratio in urban area.

About 27% of the total population is literate (1961); this is a rather high percentage of literacy in India. The percentages of literacy for males and females separately are 37.2 and 15.0 respectively. The low percentage of literacy among females is mainly due to the fact that female edu-

TABLE 6

Sex Structure, 1961

	Total	Male	Female	Female/1000 Males
Total	9,179,127	4,925,762	4,253,365	863
Rural	8,497,917	4,511,254	3,986,663	884
Urban	681,210	414,508	266,702	644

cation was not properly encouraged in the pre-Independence days. Another important factor is the social outlook of the people. The highest literacy in the region is found in the Sibsagar district, which has a legacy of being the most educated district in the valley since the Ahom period.

The population of the region is composed of heterogeneous religious groups. The major religious groups constituting the population of the region are the Hindus, Muslims and Christians. The Table will give an idea of the break-up of the population by religion (Table 7).

Occupational structure : About 43.3 percent of the people in the region are active workers. It is interesting to note that the percentage of active workers is considerably higher in the rural areas (43.7) than that of urban areas (38.1). Mention has already been made that the region is highly agrarian and, as such, most of the people depend on agriculture for their sustenance. The percentage of active workers engaged in agricultural activities is as high as 67.5, while only 8.0% of the active workers earn their livelihood from industries (5.8% from household industries and 2.2% from manufacturing industries). The percentage of workers engaged in other occupations are 3.7 in trade and commerce, 1.6 in transport and communication and 19.2 in various professions and services including plantation, mining, forestry and allied activities.

As in other parts of India, where agriculture is the main source of sustenance, this region has also registered an increasing load of population on agricultural land and as such the per capita net area of cultivation has gone down to about 0.5 acre in 1961 from about 1.7 acres in 1901. This undoubtedly has given a poor agricultural economy to the people and consequently there is great need to divert a section of the population to non-agricultural occupations through development of agro-based, forest-based and cottage industries besides a few major industrial establishments based on available resources, viz. tea, oil, etc., so that the region may have a diversified economy which is the need of a developing region.

Settlement

The origin of settlements in Assam, as elsewhere in India, is closely associated with the agricultural activities of the people. Naturally, the vast Brahmaputra valley with its extensive alluvial deposits like those of the Ganga and the Indus valleys, provides suitable setting for the rural and urban settlements.

The people of the region live in 16,307 villages and 46 towns.

Rural settlement : Most of the rural settlements in the region vary in size from small (pop. below 500) to medium (500-999) with 63.34 and 24.68 percent of the total number of rural settlements respectively. They accommodate 62.40 percent population, the share of the medium size villages

TABLE 7
Assam Valley : Population Structure (Religion), 1961

	Male	Female	Total	Percentage of total Population of the region
1. Hindus	3,596,117	3,085,779	6,681,896	72.79
2. Muslims	1,171,281	1,028,049	2,199,330	23.96
3. Christians	115,053	105,353	220,406	2.40
4. Buddhists	9,039	6,546	15,585	0.17
5. Jains	5,523	3,321	8,844	0.10
6. Sikhs	5,165	2,894	8,059	0.09
7. Others	23,584	21,423	45,007	0.49
Total	4,925,762	4,253,365	9,179,127	100.00

being 33.10 percent (Table 8). However, the number of large size (1,000-1,999) settlements is not insignificant as they represent 9.82 percent of the total settlements with 25.53 percent of the total rural population. In the Nowgong district alone this class of settlements comprises as much as 40 percent of the rural settlements.

It is interesting to note that there has been a significant decrease in the number of small size settlements as well as the percentage of population living in them in the last decade. Both the medium and large size settlements have gained considerably in number as well as population. (Table 9).

TABLE 8
Rural settlements in Assam Valley, 1961

Size class	Number of Settlements	Percentage of total Settlements	Population	Percentage of total population.
1. Very large (2,000 and above)	352	2.16	1,025,417	12.07
2. Large (1,000-1,999)	1,602	9.82	2,169,315	25.53
3. Medium (500-999)	4,025	24.68	2,812,552	33.10
4. Small (below 500)	10,328	63.34	2,490,633	29.30
Total	16,307	100.00	8,479,917	100.00

Rural settlements, in general, are nucleated or agglomerated being often arranged in an array either along the high levees of the Brahmaputra and its tributaries where the valley is considerably wide above the flood plains or along the transport arteries following the foot of the Meghalaya. The contact points appear as the more favourite sites as they have attracted the commercial plantations like tea. At the road junctions cross and fan-shaped developments are observed. In the vicinity of the Kaziranga Wild Life Sanctuary, the flood plain of the Brahmaputra is too wide, almost up to the foot of Mikir hills, and the settlements have grown along the Kaziranga-Jorhat road in a linear fashion. The pattern continues till the Dhansiri valley is reached, with the only interruption in the vicinity of Bokakhat where the settled area widens to the south. About 10 km east of Bokakhat, numerous *bils* and meanders of the Dhansiri mark the physical landscape while the tea gardens dominate the cultural landscape. It is interesting to note that within a span of about 100 km there is no town worth the name. The only town, Golaghat is located in the Dhansiri valley on the river itself, about 30 km south

of the Brahmaputra. The transport net has resulted in a criss-cross settlement growth around the town and in the valley. (Figs. 7-9).

Houses in the villages, though compact, are invariably separated by individual bamboo fences, and a typical Assamese house comprises a *Bari* which is used for kitchen garden and other domestic purposes. The settlements are located on the higher grounds along the routes and rivers in the midst of the agricultural fields. These are in most cases encircled by bamboo groves and other trees and, in fact, each household has its own bamboo brake, since it has an important place in the domestic use. Houses are mostly thatched (thatching materials being locally available *Kher*, a kind of superior quality grass) with bamboo or *Ekra* walls and bamboo or wooden frames. However, the construction of modern Assam type houses with C. I. sheet roofing and cement-plastered Ekra-bamboo walls with wooden frames is becoming popular in the villages. The roofs of houses whether of indigenous or modern Assam type, are significantly inclined both ways from the centre of the roof to cope with incessant rainfall during the pre-monsoon and

monsoon periods. In the areas inhabited by some plain tribals, such as the Miris and the Deuris, *chang-ghar* (wooden platform houses) are common while houses with arched ridges and sharply inclined roofs, a typical house type in East Bengal, are a conspicuous feature in the areas occupied by the East Pakistani migrants, particularly the Mymensinghians.

SETTLEMENT PATTERNS (ASSAM)



Fig. 7.9 A. Roadside Linear Pattern; B. Bi/side linear settlements and Sprinkling Pattern along the foot hills; C. Contact Point; D. Criss-cross pattern in the tributary valley.

Urban settlement : The urban settlements are distributed far apart from one another in the midst of rural settlements and they act as nerve centres for the variety of essential functions of the surrounding region. All the urban settlements in the valley are invariably concentrated in close proximity of the river Brahmaputra which has long been acting as the carrier of commerce and culture of Assam.²³ In fact, they have clung to the river, growing either on the bank itself or at some distance away by the side of railways, State or National Highways (all of these practically running parallel to each other from the western to the eastern end), giving thereby a linear pattern (Fig. 7.10).

The most interesting aspect of the present distributional pattern of urban centres in the region is the recent growth of a large number of market towns which have essentially come up for carrying commercial functions including collection and distribution in addition to some industrial activities on a small-scale basis and socio-cultural

functions. These centres, though could not attain the status of towns in the last census, are receiving greater impulse, especially since the last few years, owing to increasing commercial activities consequent primarily upon the increasing pressure of population on agricultural land on the one hand and developing road framework on the other. Such centres, thus, either with a complex of a daily market, a few big retail shops, a few small-scale industrial establishments—primarily agro-and forest-based, a bank, postal and telephone services, dispensary, veterinary hospital, police station, high school or higher secondary school and even a college or with a few of these establishments are potential urban settlements forming comparatively lower orders in the hierarchy of urban centres in the valley.²⁴ In addition, number of centres coming up primarily either due to the development of railways (e.g., Jogighopa, Rangiya, Chaparmukh, Furkating, Simaluguri) or the greater exploitation of mineral resources (e.g., Dhuliajan, Namrup, Moran, Mar-

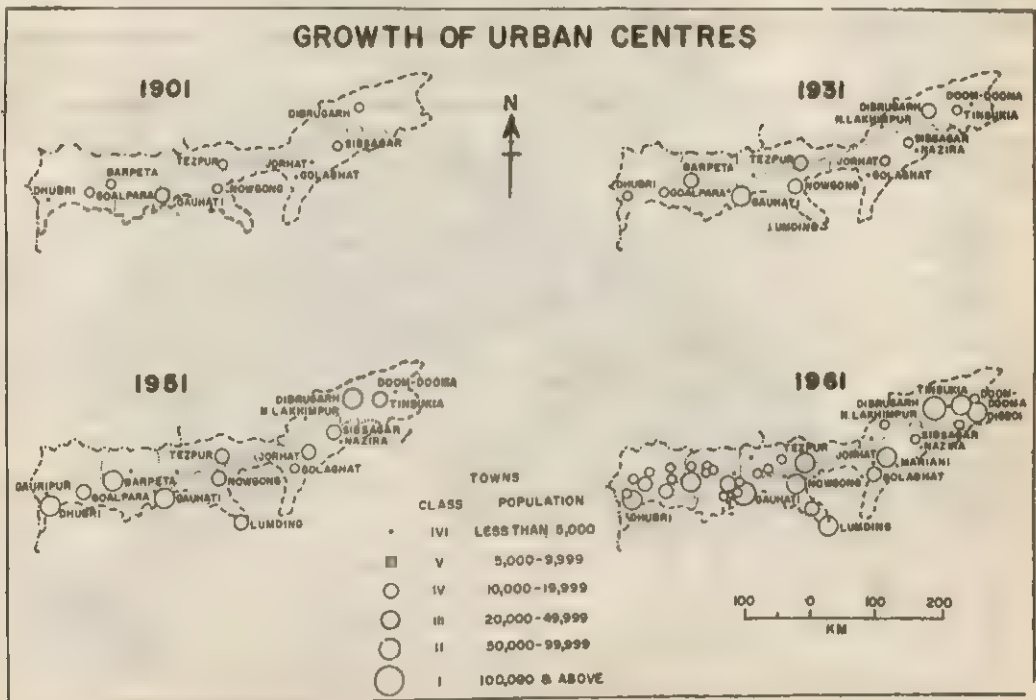


Fig. 7.10

gherita) or the growth of tea industry (i.e., Rangapara) or due to the combined effect of all these factors, have boosted up the process of urbanisation in the region.

All these centres alongwith the existing towns are thus tending to form two distinct chains of

urban settlements on both the banks of the Brahmaputra. There is, however, a break in the southern chain due to the presence of the Mikir hills. A closer study of their locations further shows that there are two major concentrations of urban settlements, one around Gauhati and

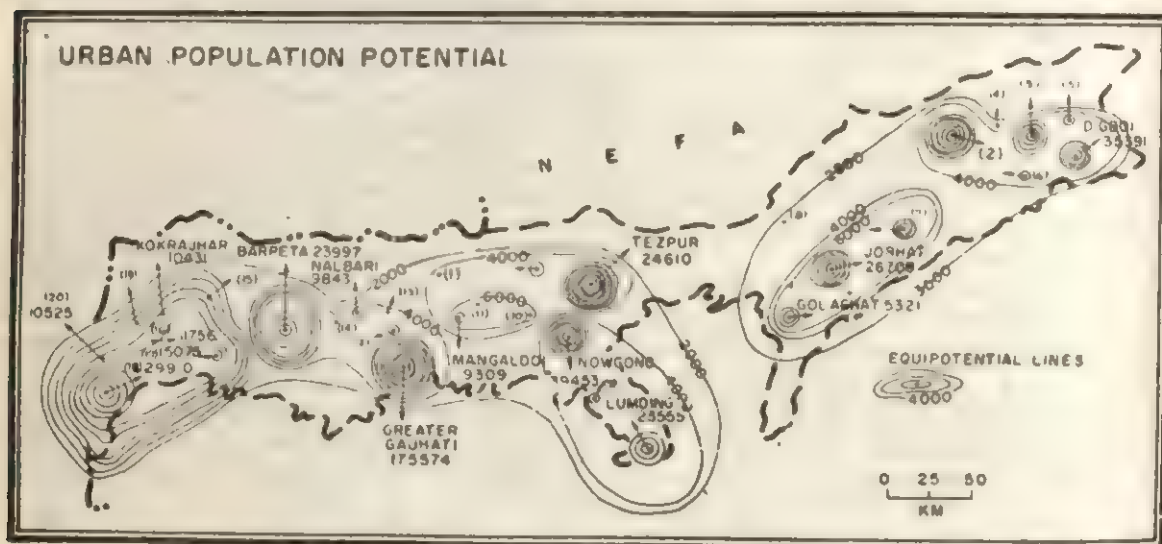


Fig. 7.11



Fig. 7.12

the other around Dibrugarh, leading to a sort of polarization at the two ends of the valley (Fig. 7.11). The other towns in the region are located either uniformly or unevenly around the major district centres. They have grown around the administrative and commercial nuclei of Jorhat, Nowgong, Tejpur, Dhubri and Borpetta. In addition, the development of Bongaigaon, Rangiya, Lumding and Mariani as railway towns is notable.

Most of the towns in the region are small in size. There are only two towns with population exceeding 50,000 : Gauhati (100,707), and Dibrugarh (58,480). The small population in the important towns is due to the fact that these centres

(except their administrative significance for which they were initially established) have very little industrial development, though now they are becoming important in commerce. Most of the larger urban centres have developed as administrative headquarters, commercial centres and transport foci in the region. Functional morphology of Gauhati (Fig. 7.12) reveals its significance as a State capital. However, Digboi has exclusively developed as an oil town, and Tinsukia as a conspicuous commercial centre (Fig. 7.13). Other towns are mostly sub-regional administrative centres or market towns at the junctions of transport routes that serve the surrounding villages.

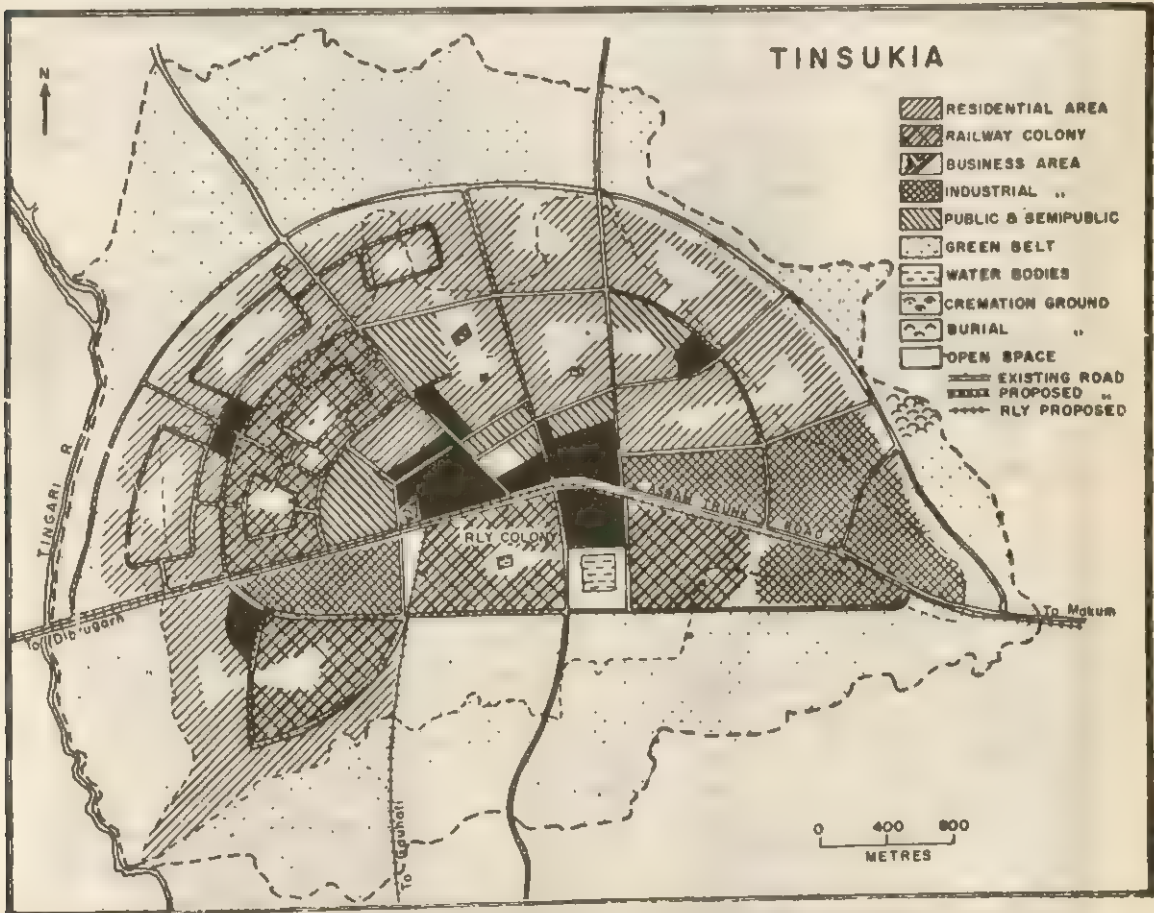


Fig. 7.13

The Economy

Agriculture is of basic importance to the region because it not only provides most of the food requirements and gives employment to an overwhelming proportion of population, but also furnishes certain raw materials such as tea and jute which constitute the back-bone of the regional economy in trade and commerce. According to the 1961 census 2,682,060 persons constituting 67.5 percent of the active workers are directly engaged in agriculture and another 10 percent are engaged in plantation, livestock and other activities allied to agriculture.

Land-use : The land-use figures of the region show that unlike any other major river valley

region in India, the Assam valley has almost equal percentage of areas under cultivation and forests, each comprising about 34 percent of the total land. In fact, by 1953-54, the forests occupied the primary position in land-use with 35.3 percent while the net area sown occupied the second position with 31.6 percent.²⁵ At present about 22 percent of the land is not available for cultivation mainly due to physical handicaps, particularly the vast area under water which includes the beds of river Brahmaputra and its innumerable tributaries and large tracts of swamps and marshes. About 10 percent of the land, though cultivable, is not used for cultivation as it is under groves of bamboos and miscellaneous trees and current

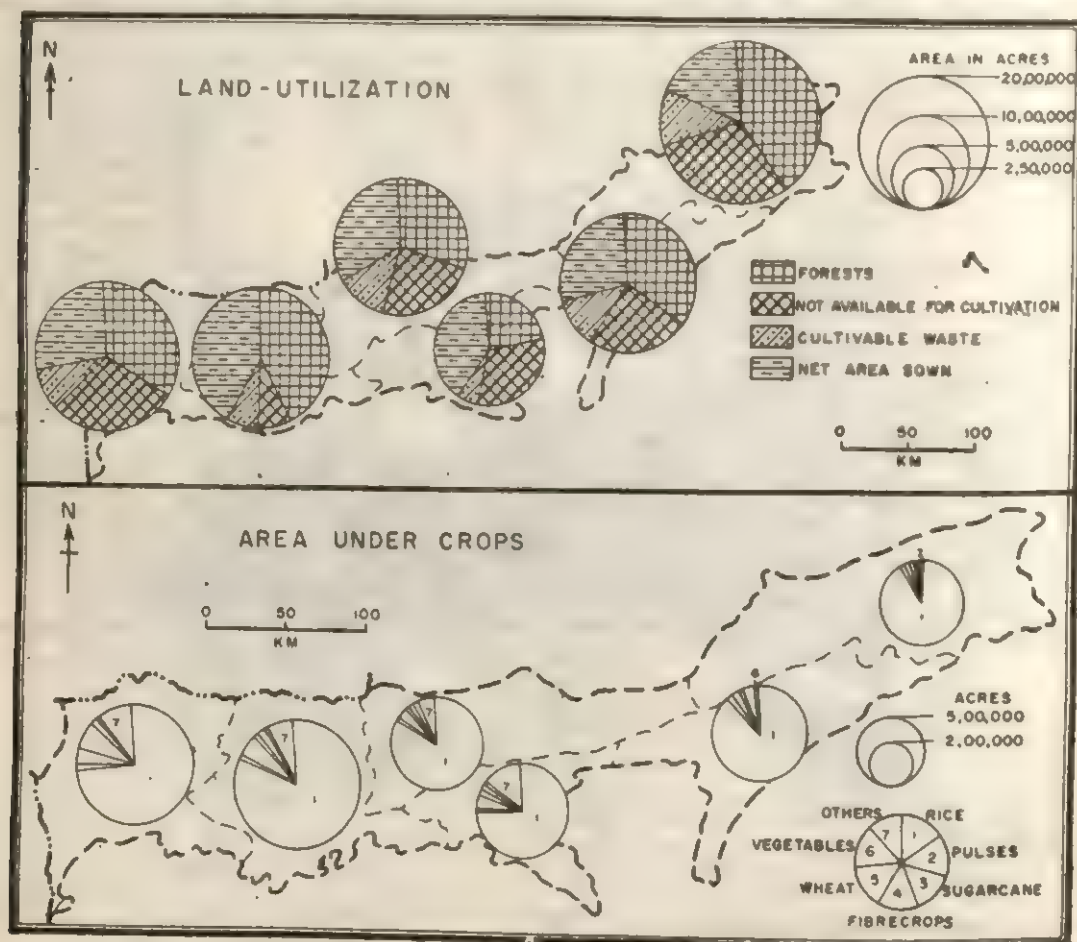


Fig. 7.14

fallow and permanent fallow including pastures (Fig. 7.14).

There is a considerable disparity in the agricultural resource-base from one district to the other. The Kamrup district has the highest net sown area (43.3%), while Lakhimpur registers the lowest figure (18.1%) due to a large acreage being under forests (42.1%) on one hand, and non-availability of cultivable land on the other. The net sown areas in the districts of Goalpara, Darrang, Nowgong and Sibsagar occupy only 24.0%, 33.8%, 41.9% and 28.7% respectively.

Agriculture : Though agriculture is the main occupation and primary resource-base of the region, the per capita net sown area is as low as 0.5 acre, since only 34 percent of the land is under crops. The per capita sown area may be increased through different reclamation measures. About 5 percent of the land can be brought under plough by controlling the inundation of rivers and reclaiming a considerable portion of lowlying areas. But this would not give any satisfactory solution to the problem of pressure on land since with all possible reclamation measures, the net sown area can hardly be raised upto 40 percent of the total land, because on one hand the areas under forests can in no case be brought under cultivation as they provide a significant base to the economy of the region and check soil erosion, and on the other, the vast water bodies and the marshes and swamps occupy a considerable per-

centage of the land area. Thus, the remedy to the problem of pressure on land has to be sought in increasing the yield per acre through double- and multiple-cropping and adoption of modern agricultural techniques. A section of the agricultural population could also be diverted to small-scale industrial schemes based on local resources to ease the problem considerably. Further steps, if taken to check the damage done to crops of the existing cultivated lands by the annual floods, may substantially increase the per capita yield of agricultural crops. Moreover, attention should be paid towards checking the rapid rise in population in the region so that the per capita cultivable area may not go down to an alarmingly low figure.

Out of the total cropped area (5,135,856 acres) in the region, food-crops occupy an overwhelming proportion (77.1%), while the cash-crops, such as tea, jute, tobacco, sugarcane and oil-seeds comprise 21.4 percent and the minor crops, such as, vegetables, potatoes, fruits, cotton, etc. occupy 1.5 percent. The area put to cultivation of food grains has steadily increased over the period of the Five Year Plans (Table 9).

Rice is the principal crop throughout the region occupying more than two-thirds (72.8%) of the total sown area since it is the staple food crop of the people in the region. The distribution of other crops is rather uneven. Next to rice, comes tea which occupies 6.7% of the total

TABLE 9
Variation of Area under food—grains in Assam Valley.
(In thousand hectares)

District	1951-52	1955-56	1960-61	1964-65	1966-67
Goalpara	225	231	250	314	354
Kamrup	415	411	424	428	434
Darrang	215	228	240	238	247
Nowgong	197	217	225	213	215
Sibsagar	214	222	245	248	247
Lakhimpur	182	170	186	192	201
Assam Valley	1,448	1,479	1,570	1,633	1,698

Source : *Economic Survey, Assam 1967*, Dept. of Economics and Statistics, Govt. of Assam, Shillong.

cropped area. More than four-fifths of the tea plantation area are concentrated in the districts of Lakhimpur, Sibsagar and Darrang while the rest is distributed in the other districts of the region. Jute stands third in acreage having 5.9% of the net sown area although its position in respect of economic value is high and it comes next to tea. Heavy concentration of Jute crop is in the Lower Assam Valley and in the Darrang district of the North Bank tract which together account for about 90 percent of the total Jute-acreage. Oilseeds take the fourth position in acreage with 5.7%. Most of the area under oil seeds, mainly rape and mustard, are in the districts of Goalpara, Kamrup, Darrang and Nowgong while the rest is distributed rather unevenly. Pulses occupy about 3.7% of total crop-area and are mainly grown for home consumption in the Lower Assam Valley. Sugarcane, though only occupies about 2.4% of the net crop-area, is a high value cash crop in the valley and is grown in small patches throughout the region but it is

more concentrated in the Sibsagar and Kamrup districts. Tobacco shares a very small portion of cultivated land though its output per acre is very high.³⁰ Its cultivation is primarily concentrated in the Lower Assam Valley. The minor crops, as stated above, occupy a small acreage of crop-land among which potato and vegetables are remunerative (Fig. 7.14).

Tea Plantation in Assam dates back to 1833 and since then the plantation developed steadily and by the last quarter of the 19th century it became the chief export item of the country as a whole. The tea growing areas are mainly confined to the Assam Valley (Fig. 7.14 Inset) in general and the Upper Assam Valley in particular (Lakhimpur, Sibsagar Darrang and Nowgong districts.) Out of over 7,100 tea estates of India, the Assam Valley alone accounts for more than 700 estates with average acreage of about 500 acres. Punjab and Himachal Pradesh (about 1,400 estates), though outnumber Assam Valley in the number of tea estates, the acreage per

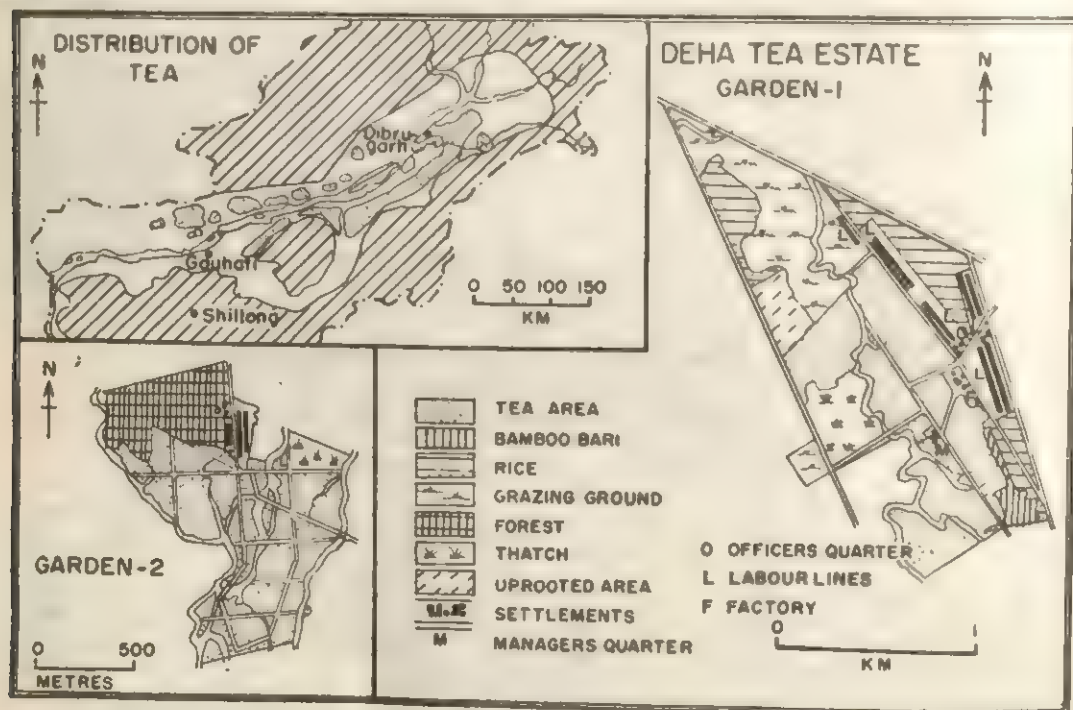


Fig. 7.15

estate averages less than 8 acres. Small 100-300 acres) and very small²⁷ (less than 100 acres) tea estates in Assam Valley are about 300, majority of which are located in Sibsagar (41; 132) and Lakhimpur (38; 541) districts, which together account for more than 70% of the Valley acreage under tea-estates. Medium size estates (300-500 acres) are about 90 while the large estates (over 1,500 acres) are about 290. Larger tea estates are predominantly in the Lakhimpur (105) and Sibsagar (95) districts.

The larger tea estates are more or less self contained units as is evident from the study of Deha Tea Estate (Fig. 7.15), about 16 km east of Jorhat (Sibsagar). This 700-acre estate has two gardens and a separate factory for processing tea leaves. The land-use figures²⁸ show that about half (48.07%) of the area is occupied by tea and about one-tenth is devoted to rice and vegetable cultivation, essential for the employees. Thatch and bamboo thickets occupy about 10% and provide materials for fencing and thatching. Jungle cover (72 acres) is being cleared and re-

claimed gradually. About one-tenth is the built-up area consisting of planned residential quarters of officers and workers, office, factory, etc. In addition, there is a grazing ground also within the Tea Estate (Fig. 7.15).

This oldest and well organised industry of the valley paved the way for the development of transport and subsequent facilities in the region. It provides the largest source of employment in the region, directly or indirectly, and about 55% of the employees are females. In spite of its manifold problems such as climatic, social and economic, the industry still shows a good promise for the valley.

Sample Villages

The landuse patterns of the two villages, Deharkuchi and Dispur clearly reflect the environmental influences of the Assam Valley. Both the villages lie in the Kamrup district (Figs. 7.16 and 17) but the former is situated about 13 km south-east of Nalbari town in the Lower Assam Valley North, while the latter about 5 km southwest of Gauhati in the Lower Assam Valley South. Deharkuchi

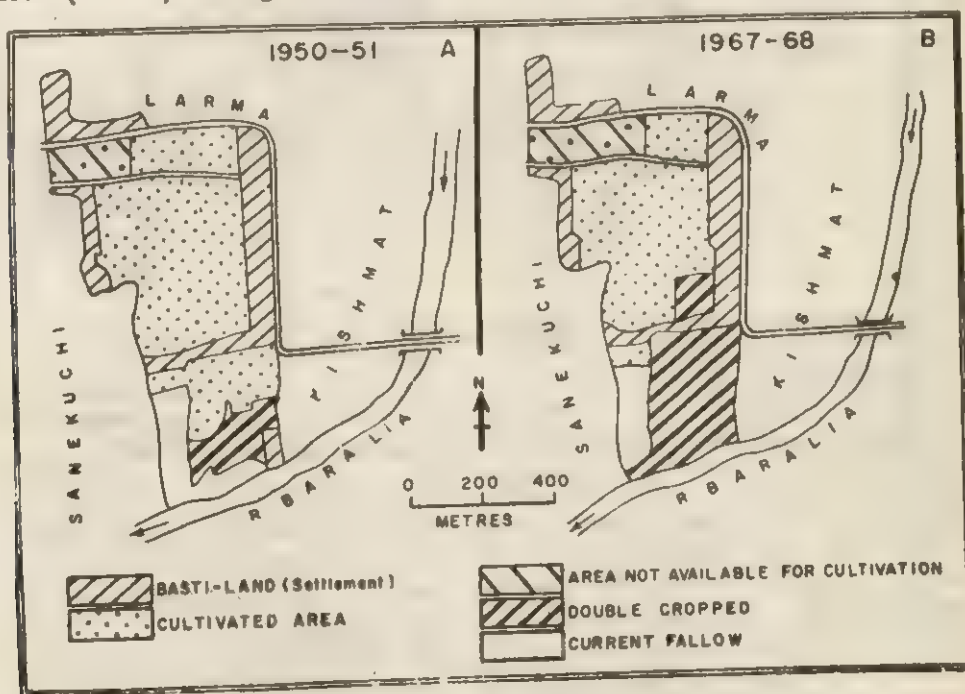


Fig. 7.16 Deharkuchi Landuse

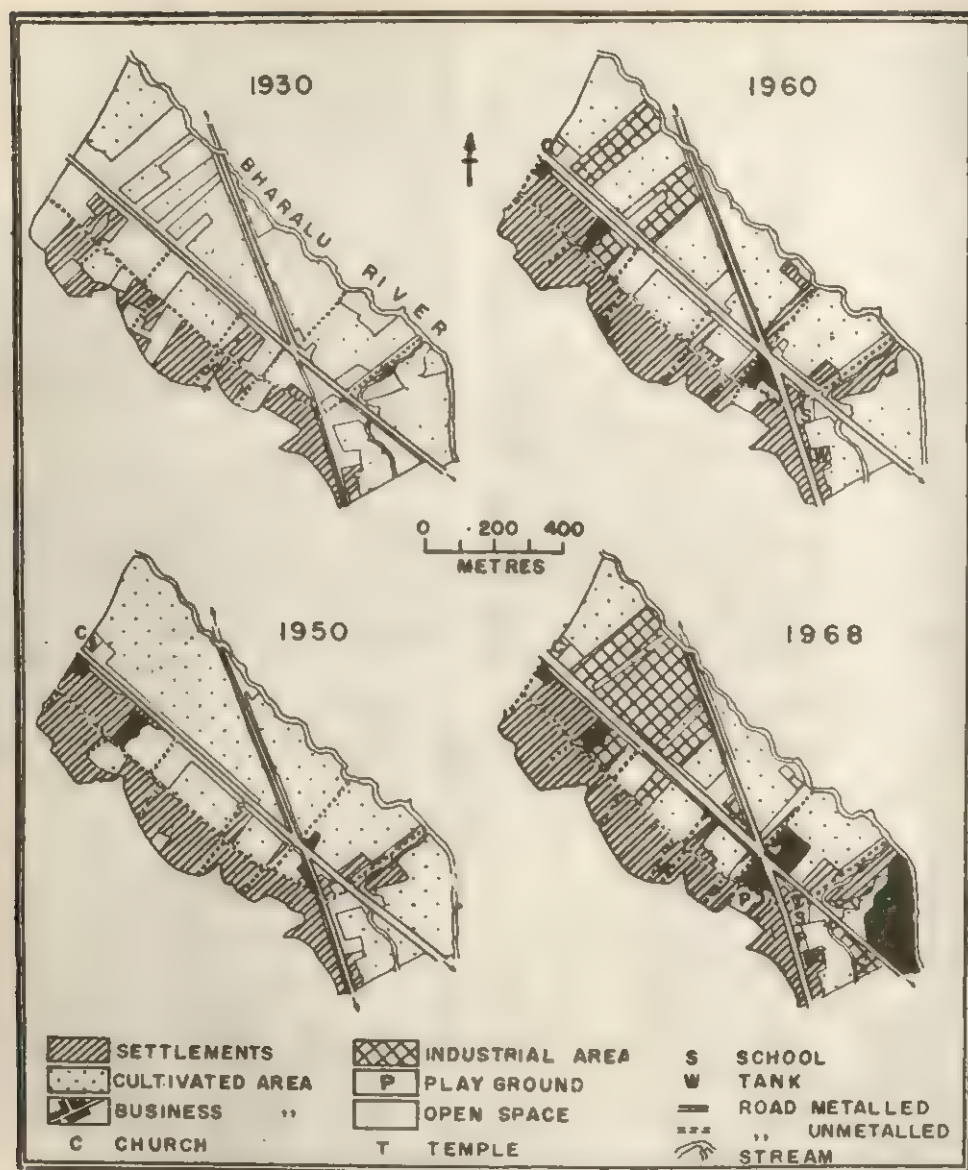


Fig. 7.17 Dispur, changing landuse

still retains its rural (agrarian) landscape with over 90% of its area under cultivation, while the latter is emerging fast as an industrial and commercial suburban settlement with cultivated land being reduced to 28.1% (49.32 acres in 1968) from 52.7% (92.42 acres in 1950).

Deharkuchi²⁹ (185.6 acres and population 633; 1961) is located in the flood plain of the Baralia.

The higher pressure on land has forced as many as 201 persons to live in towns. The excessive rainfall resulting in overflooding restricts the area under *Kharif* crops to less than 60% of the area while in *Rabi* it exceeds 90%, a characteristic feature prevailing since 1950. The irrigation facilities (minor irrigation schemes) have now provided irrigation for about 45% of the culti-

vated land leading thereby to significant changes in cropping pattern and also to the intensification of land-use through double cropping. It is notable that the acreage under paddy, both summer and winter, is increasing (from 66.8% (1950) to 84% (1968) and 53% (1960) to 76% (1968) respectively), while acreage of other crops, except mustard and pulses, has declined (Jute 21.3% to 8%; sugarcane 21.9% to 4%; tobacco 6% to nil) during the period under review. In the Kharif season, the new variety, known as *Bodo*, introduced recently, is replacing jute in the low lying areas.

Dispur³⁰ (176 acres), a typical Boro-Kachari village in the Bharalu flood plain and by the side of the road junction on the Gauhati-Shillong highway, shows the impact of Gauhati. The settled area remained confined to the relatively higher grounds in the vicinity of Narakasur hill, lying to the south west. Agricultural pursuits and lumbering constituted the main occupations. The cultivated lands accounted for 43.6% (1930) which rose to 73.79% (1960) due to the reclamation of open spaces in the flood plains, and declined to 28.1% (1968) because of the establishment of industries, such as Kamrup Flour Mill, Glaxo Laboratories, Steelworth Ltd., and the Gauhati Industries (1956-1960) and adding thereby business and commercial activities to it, all taking the road side locations (Fig. 7.17). Consequently the built-up area rose to 66% (1968) as against 23% (1930) while open spaces declined to 4% from 32% during the period under review. Now there are as many as 50 shops against 16 in 1961. Several immigrants (48 households) have settled in this village, most of the inhabitants being engaged in non-agricultural pursuits (41; 1968). The number of local families is more or less static (52 in 1955 to 53 in 1968), mostly engaged in agriculture (46).

Agriculturally the region takes, no doubt, a homogeneous character with rice occupying the bulk of the area of agricultural landscape, there is a good deal of regional variation in the cultivation of the secondary crops and it is this variation which divides the valley into three major crop-combination regions. These are (a) the

rice and tea crop region; (b) the rice, tea and jute crop region; and (c) the rice, jute and diversified crop region.

The rice and tea crop region comprises the districts of Lakhimpur and Sibsagar where these two crops occupy about 90 percent of the net sown area. This region specialises in the cultivation of the commercial plantation crop, tea, owing to favourable soil and climatic conditions. Other crops such as sugarcane, oilseeds and pulses are subsidiary to rice and tea.

The second crop region comprising the two central districts, Nowgong and Darrang, has the two crops jute and tea next to rice. This region differs from the previous crop region in that jute is gradually replacing tea. Other crops like pulses, oilseeds and vegetables are subsidiary.

The third crop region comprises the westernmost districts of the valley, viz. Goalpara and Kamrup. It has a diversified crop combination with large areas under pulses, oilseeds, sugarcane, potato, tobacco and vegetables etc. in addition to rice and jute.

It is apparent that the second crop region has a transitional character, growing tea as in the easternmost districts and jute as in the westernmost districts. On the other hand, the easternmost crop region differs from it with less importance of jute and the westernmost crop region with insignificant acreage of tea. It may be mentioned here that recently wheat has been successfully introduced to this area.

Irrigation : The rainfall is so plentiful over most of the areas that the farmer hardly feels the deficiency of water in his crop-land. In the past, the tribals such as the *Kacharis* and the *Meeh* used to practise some sort of gravity irrigation in the foothill fringes of the valley through construction of small channels for conveying water of the hill-streams to their fields. Recently, attention has been paid by the government in certain areas to supply water to the agricultural lands in the drier part of the year, particularly in winter, for the *Rabi* crops. In the Nowgong district, wheat has been successfully introduced through irrigation. The tea gardens, both of

Lower and Upper Assam, use minor irrigation systems, particularly through power pumps and small canals to ensure supply of water to the tea crop in the drier months of February and March. It may be mentioned here that the Kaki Reclamation project of the Nowgong district has particularly failed because of lack of water, but this can be made up if irrigation is done either from the river Kapili or the river Jamuna. The deficiency of water in the winter months, particularly in the central part, necessitates the provision of irrigation measures in the valley.

The Jamuna Irrigation Scheme in the Nowgong district is the first big venture in the irrigation sector with potentiality of 64,000 acres at a cost of about 17 million rupees. The main barrage will be at Bakaliaghat on the river Jamuna in the Mikir hills. The total length of the canal system will be about 164 Km²¹. The second scheme, the Mora-Dhansiri project is in the Sib-sagar district with an irrigation potentiality of 9,000 acres at an estimated cost of 2 million rupees. It is hoped that these schemes will ensure irrigation to the agricultural lands during the period of water-deficiency within a few years.

About 22 percent of the net sown area is irrigated in the valley²². By 1957-58 the acreage under canal irrigation was 725,421 while only 6,282 acres were irrigated by tanks and 325 acres by wells, the rest being through other sources including power-pumps and lift irrigation. It is worthwhile to note that almost all the tank-irrigated area lies in the Kamrup district with only 125 acres in Goalpara district. Canal irrigation is more common in Lakhimpur and Goalpara while it is conspicuously absent in Sib-sagar. Other areas in the valley take to irrigation through either small canals or power pumps.

The foregoing analysis clearly shows that the region is typical of an under-developed agricultural economy in which most of the cultivated area is devoted to almost subsistence crops, mainly for local consumption and the immediate market. Only tea and jute are commercial crops of importance. The region is, however, a surplus one in cereals, but it has an acute shortage

of pulses and oilseeds. The surplus in cereals again cannot be sustained in view of the rapid population growth. As there is acute deficit in all the food items except cereals, the rate of increase in food production in the future will have to be substantially increased to meet the food requirements of the growing population. Its geographical isolation and strategic significance further make it necessary for the region to have food self-sufficiency. In this connection it may be mentioned here that the smuggling of rice into East Pakistan, particularly from the border districts, need also be checked as a measure against shortage of food grains in the near future.

Livestock : The cattle are of great importance in the agricultural economy. They provide cheap motive power for the agricultural operations and in addition provide farmyard manure. Owing to poor breed, their milk yield is low. Next to cattle the goats and buffaloes have an important place in the livestock. Now poultry farming is gaining importance.

The region has 5,586,875 heads of cattle, 432,357 of buffalo, 1,647,826 of goats and 332,162 of sheep and other livestock (1961). The total number of poultry including ducks and hens is 6,861,064. The figure for total livestock per thousand population is 860 whereas it is 656 for the cattle and buffalo. Though the livestock occupies a significant place in the agricultural economy of the region, it is in a poor condition due to poor breed, shortage of fodder, inadequate care and various diseases. Hence, the production of milk and draught-capacity of the cattle are very low.

Forestry : In the rich forest lands, particularly of the Upper Brahmaputra Valley, there are many trees with high timber-value including the veneer species for plywood and tea-chests and the famous 'iron wood' (*Nabor*) for constructional purposes. The tropical wet-deciduous forests of the Lower Brahmaputra Valley abound in high grade timber including *sal* and *teak*. Quite a few ply-wood factories and many timber mills have developed in the region but the rich forest resource including the huge bamboo re-

TABLE 10

Out-turn of Timber, Fuel and minor Forest Produce in Assam Valley, 1963-64

Forest Division	Timber '000 cft.	Fuel '000 cft.	Minor produce. (Value in '000 Rs)
Darrang	582	546	540
Nowgong	171	390	70
Sibsagar	955	1,503	557
Dibrugarh	2,050	1,460	614
Digboi	2,241	771	449
Goalpara West	1,181	1,819	78
Goalpara East	657	666	955
Kamrup South	599	784	367
North Kamrup	517	432	1,153
Dhansiri Valley	1,045	144	250
Assam Valley	9,998	8,515	5,033

Source : Department of Forests, Assam.

serves demands the establishment of paper and pulp industries.

The table (Table 10) shows the resource value of forestry in the region.

Industrial Economy

Though the Valley appears to be industrially important in the North-East India with its relative industrial supremacy over the adjoining areas in Assam, it would rather appear to be a void on the Industrial Map of India, excepting however, its tea and petroleum industries.

The region is potentially rich in industrial raw materials as has been apparent in the foregoing discussions, but their economic exploitation has been hindered by several factors such as its isolation from the rest of India due to poor transport and communication system, paucity of capital, a very small local market, shortage of cheap labour, lack of enterpreneur and non-availability of cheap power.

The industrial landscape of the region is limited to small pockets around Gauhati in Lower Assam and around Dibrugarh in Upper Assam. It may be recalled here that only 8 percent of the active workers earn their livelihood from industries with the majority (5.8%) engaged in household industries and only 2.2% in manufactur-

ing industries. In addition, 19.2 percent of the active workers are engaged in mining, plantation and other associated occupations. The existing industries of the region may be classified under the following categories : (a) Agro-based, (b) Mineral-based, (c) Forest-based, and (d) Miscellaneous.

The agro-based industries can be sub-divided into (a) Food-processing and Sugar, (b) Tea processing and (c) Textiles. The food-processing industries consist of rice and flour mills, fruit canning, a limited number of dairy units and oil-crushing mills, a few bakeries which are concentrated in the major urban centres of the valley. Rice mills are largely concentrated in the Nowgong and Kamrup districts. The only sugar factory is located at Barubamungaon near Dergaon in Sibsaigar district. Although the region has great potentialities for cane cultivation, and for establishing sugar mills, the expansion has been delayed partly because of the severe competition from *khandari* and *gur* which are practically untaxed. Moreover, cane-growing is so scattered that feeding a sugar mill regularly in normal sugarcane crushing season is difficult and, thus, the cost of production has to be very high (Fig. 7.18).

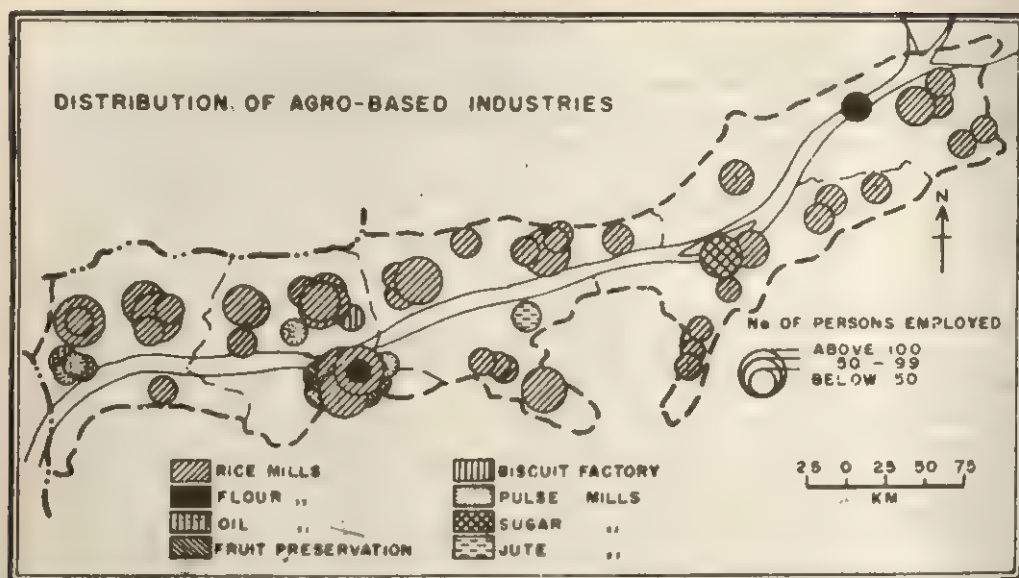


Fig. 7.18

But the most significant agro-based industry of the region is the tea industry confined mostly to the districts of Lakhimpur, Sibsagar and Darrang. There are 636 tea gardens and factories out of which the two districts, Lakhimpur and Sibsagar, alone have 491. The average daily number of daily labour employed in the tea industry of the region is 379,781 and the total annual production of tea in 1966 was 169,643,000 Kg. This region produces about 45 percent of the total Indian tea contributing about 15 percent of the State income of Assam.

The textile industry is perhaps the least developed having only one jute mill at Silghat and one spun-silk mill at Jagiroad, both in the district of Nowgong. Recently a power loom unit has been established at Gauhati. Though the region produces about one-fourth of the total Indian jute, its manufacturing is yet to be developed. A co-operative sector unit will start production soon (1970). However, the bulk of jute of the valley feeds the jute mills of West Bengal.

It may be noted here that the spinning and weaving of cotton and silk is, in general, a household industry in the region which is a part-time job of the common Assamese womenfolk. Assam handloom silk is widely known. There

are three varieties—*Eri*, *Muga* and *Pat*. *Eri*, the soft, yellow-coloured warm silk is now available in other parts of India, but *Muga*, the gold-coloured silk which improves with every washing in texture and colour, is not to be found elsewhere in the world. *Pat* which is mulberry silk, is white or light yellowish in colour and is somewhat inferior in quality to Japanese silk of the same variety. The climate and vegetation of Assam valley make it a suitable habitat for the silkworms. The production of Assamese handloom silk, *Eri*, *Muga* and *Pat* on a commercial basis is rather limited to the Kamrup district. In fact, the cocoons thrown away as unsuitable for reeling by cottage industry method in the Lower Assam Valley are taken to the spun-silk mill at Jagiroad which was expected to depend on the supply of this raw material. But the local supply was only 10 percent of its consumption and the rest (90%) was mulberry waste imported from Mysore and Kashmir.

The mineral-based industries of the valley are limited to the coal-mining (both open cast and underground) and oil and gas production both in Upper Assam and a fertilizer factory at Namrup in Lakhimpur district. However, the various mineral-based industries in this region include

PLATE VI



Dattabad, a typical fishermen village of the Salt lakes area



A boat loaded with logs coming from the Sunderbans



A view of Jammu Town Spires of the temples are prominent landmarks



A view of Kathua market

manufacturing of bee-hives; coke-making, oil refining, filling in and distributing of gas cylinders for industrial (such as power generation and tea drying) and domestic purposes, calcining of petroleum coke, quarrying and stone-crushing for road metal, brick and tile making, household clay hollow-ware, railway workshops, engineering works and body building of motor vehicles. About half of the workers in the metallic mineral-based industry are employed by the railway workshops. The majority of the engineering works are small-sized and ill-equipped and devoted to repairing services. But there are two fairly big engineering workshops at Tinsukia and Digboi in the Upper Assam Valley. There are a few iron and steel mills of small size in Dibrugarh, Tinsukia and Jorhat to manufacture agricultural and tea garden equipments and fabricated structures. There are two plants producing rods and bars, one at Gauhati and the other at Dibrugarh with annual capacity of 18,000 tons although the local demand by 1971 is estimated to be 60,000 to 65,000 tons. Therefore, there is enough scope for a few more re-rolling mills. One big bicycle manufacturing unit has been established at Gauhati with a licensed capacity of 60,000 per year. In addition, many small and medium-sized units, manufacturing various products such as aluminium utensils, cycle parts, trunks and buckets, tubewell pipes, etc. are also in operation in major towns of the region. The region is well known for its manufacturing of brass and bell metal utensils in its cottage industry sector, while at a commercial level it is concentrated in Sarthebari and Hajo in Kamrup district and Tibrabar in Sibsagar district.

The non-metallic mineral-based industry of the region mainly comprises the oil-refinery at Digboi producing approximately 0.50 million tons of oil per year, the oil refinery at Noonmati (Gauhati) producing 0.75 million tons and the collieries in Upper Assam producing (1965). 541,000 tonnes of coal. The surplus crude oil of the region is piped to the Barauni oil-refinery in Bihar which has an annual refining capacity of 2 million tons.

Based on the local natural gas, a chemical fertilizer plant and a thermal power generating plant have been started at Namrup. Some amount of gas will be used by the "Gas Grid" for supplying gas to the tea gardens. Use of gas stoves using natural gas filled-in cylinders has recently found popularity in the urban areas and, as such, filling-in and distributing of gas cylinders is growing as an industrial unit. Establishment of a petro-chemical complex to produce plastics, polythene and other petro-chemical items making use of the natural gas is recommended by a team of Japanese technicians and it has been duly recognised by the Central Govt. However, at present, the bulk of gas is being flared up at the rate of 31,000 cft. daily in the Upper Assam Valley alone. Further, the gas produced from Gauhati refinery is also being burnt away. It is hoped that a check to this national waste will be effected if petro-chemical industrial concerns are set up in immediate future. The Namrup Fertilizer Plant is producing fertilizers enough to meet the requirements of the Assam State, the annual production target being 0.1 million tonnes of ammonium sulphate and 55,000 tonnes of Urea (1970).

A cement factory is coming up at Bokajan in the Upper Assam Valley which will make use of the locally available raw materials.

The rich forest wealth of the valley has helped in the development, though partly, of such forest-based industries as the saw milling and plywood furniture and cabinet making, cane works, a modern match factory at Dhubri, a hardboard factory with a capacity of 50 tonnes per day near Gauhati and a few *Khoir* and *Agar oil* manufacturing units. Till 1950-51, the only significant forest-based industry was saw-milling spread over all important towns in the valley with a prevalence of hand-sawing. The first plywood industry was though ~~located~~ in the region at Margherita as early as 1944 using the valuable veneer species of Upper Assam, there was hardly any growth in this group till 1955-56, since when there has been considerable development mainly due to the growing demand for the use of plywood for tea chests and other purposes.

The major centres of plywood industry are at Margherita, Mariani and Tinsukia in the Upper Assam Plain. A paper mill is coming up at Jogighopa in the Goalpara district and it is expected that the production will be effected within a couple of years.

The miscellaneous industries of the region comprise a variety of such minor industrial units as printing presses, ice manufacturing, distilleries, electric light and power, and miscellaneous repair works. These are distributed in the urban centres.

Transport and Communication

The transport and communication system as a whole is not well developed. The isolated location of not only this region but of the entire North-East India being linked with the rest of India by only narrow corridor between the Himalaya and East Pakistan, has to a great extent prevented the development of a quick and efficient transport system in the region. The growth of inland water transport is also checked by the inclusion of the lower part of the Brahmaputra in East Pakistan. Within the region itself the development of roads and railways has been hindered by the existence of numerous rivers and streams which have shifting courses requir-

ing frequent bridging and circuiting of tracks. However, the region has a much more efficient transport and communication system than the surrounding hilly areas (Fig. 7.19).

The region has about 1,718 km of railways with a density of 3 km per 100 km². Except for a length of 100 km of broad gauge line which has recently been constructed up to Jogighopa on the north bank of the Brahmaputra, the entire system in the region is metre gauge. The two main railway lines run longitudinally along both the banks of the Brahmaputra and connect most of the major urban centres on either side. New towns like Bongaigaon, Rangiya, New Gauhati, Lumding, Mariani and Tinsukia have grown mainly due to the development of railways. Tea, jute, petroleum and petroleum products are the main commodities transported by the railways. The main line from Tinsukia to Gauhati and westward handles a fairly heavy traffic of more than 1,000 net ton-miles per route per day each way.³⁴ Large areas in the region, however, are yet to be provided with railway services. Even the main railway line on the south bank of the Brahmaputra does not pass through the main towns like Nowgong, Jorhat and Sibsagar and these towns are being connec-



Fig. 7.19

red with the main line by minor branch railway lines. It is worth mentioning that although the construction of railways in the region dates back to 1880's, its expansion has been very slow due firstly to the lack of sufficient industrial development, and secondly to the geographical conditions mentioned above. In fact, the railway line along the north bank of the Brahmaputra linking Rangapara with Murkongselek (about 300 km) was constructed only recently with the primary aim of easing transport and communication to NEFA. Further, the Assam Link that connects the region with the rest of India is not dependable during the rains owing to the heavy incidence of breaches by the torrential hill streams. On the other hand, the volume of traffic, both in passenger and goods, is increasing rapidly to and from the region and, as a result, the railways, being metre gauge, are overburdened. All these, as such, call for the improvement of the railway-system in the region through the extension of broad gauge line from Jogighopa to Dibrugarh and introduction of railway lines to the areas not served so far.

There are about 13,155 km of roads including P.W.D., District and Village roads with 1,140 km of National Highways and 714 km of State Highways accounting for a density of 23 km of road per 100 km² of area. The two Trunk Roads, North Trunk Road and South Trunk Road, run almost parallel to the river banks. Of these the South Trunk Road or the National Highway 37 is very important and it passes through the important administrative and commercial centres like Goalpara, Gauhati, Nowgong, Jorhat, Sibsagar and Dibrugarh. Both these trunk roads have many feeder roads spreading over the entire region. The road system in the region is being developed, although the efficiency of the system is hampered by the existence of numerous rivers and streams which necessitate considerable extent of bridging. Nearly one-third of the National Highway is still unmetalled and unfit for use by vehicular traffic during the rainy season. There are regular bus services run by the Assam Transport Corporation over 2,934 km of roads. The rural

areas surrounding the urban centres are also served by daily bus services. Recently, Interstate lorry services have also been introduced between West Bengal, Bihar and Assam. Gauhati is the transport focus of the region not only by roads but by other means as well. The recently constructed bridge on the Brahmaputra at Gauhati has now provided road transport link between the two sides.

The navigable inland waterways cover a total length of about 3,261 km of which about 1,653 km are navigable by steamers and large country boats throughout the year and the rest is only navigable during the monsoon period. The Brahmaputra is the main water-way with a length of about 720 km. The tributaries such as the Subansiri, the Bharali, the Pagladia, the Manas, the Burhi-Dihing, the Disang, the Dikhow and the Dhansiri are also navigable for varying distances in their lower reaches. However, the earthquake of 1950 greatly affected the steamer navigation in the Upper reaches of the Brahmaputra and, as a result, steamers now cannot operate beyond Nimati. Above all, the Partition has dealt a severe blow to the steamer navigation of the Brahmaputra. Formerly, the bulk of the export and import trade of the region to and from Calcutta passed through this river. But now due to a number of restrictions imposed by Pakistan, the river has fallen to almost insignificance as a river route for external trade. However, it plays an important role as an inland waterway in the region. But since May 1967, when the Union Govt. decided to float a new company in the name of Central Inland Water Transport Corporation to take over the assets of the River Steam Navigation Company, which used to operate Trans-Pakistan services, the major inland waterways are not in operation.

The air transport in the region is fairly developed. The region has the advantage of having several air fields constructed during the Second World War. The amount of air-borne traffic between the region and Calcutta is considerably high. The inter-State air freighter services are important to the region in view of its isolated location and transport difficulties. There

are now five airports : Borjhar (Gauhati), Saloni (Tezpur), Rowroyah (Jorhat), Lilabari (North Lakhimpur) and Mohanbari (Dibrugarh) and are linked with Calcutta by daily passenger and freighter services.

The Regions

With all the apparent homogeneity of broad physical and cultural characteristics, the Assam Valley does present significant variations. The upper reaches of the valley, though physically almost monotonous, are characterised by high rainfall (200 cm at places) alongwith rich forest and mineral potentials, particularly the oil and coal which are totally absent roughly west of 94°E longitude. In addition, this monoculture area (rice 72%) has tea as cash plantation crop, the intensity of which decreases westward ultimately to lose its significance in the districts of Goalpara and Kamrup where jute stands next to rice with association of sugarcane in Nowgong and Darrang districts. Moreover, the area west of 94°E longitude being the leeward side experiences relatively greater influence of the Meghalaya and as such, is rendered a bit drier with less than 125 cm rainfall at places (especially the eastern part). This belt around Nowgong and Darrang districts represents somewhat transi-

tional character between the rice-tea culture on to its east and the rice-jute belt to its west as also climatically. It essentially can be included with its western counterpart as it also lacks oil and coal and the related mineral-based industries in general. Thus the Assam Valley can be divided into two first order regions. 12. Upper Assam Valley and 13. Lower Assam Valley with boundary coinciding with the demarcation between Nowgong and Sibsagar districts in the south of the Brahmaputra roughly along 94°E and along the western catchment limit of the Bharali river in Darrang district north of the Brahmaputra. The first order regions are divisible into 4 second order and 10 third order regions (Fig. 7.20).

21. *Upper Assam Valley* includes the districts of Lakhimpur and Sibsagar and major parts of Tezpur tahsil of Darrang district. In the first place it is seen that the major tea growing area of the valley is confined to this eastern part, which is also the most important area for mineral oil, commercially exploitable forest resources and has potentiality for industrial growth. This region is a monotonous plain except for the low hill ranges along the southern and south-eastern border. The common agricultural activity in this area is not simply conned to rice growing

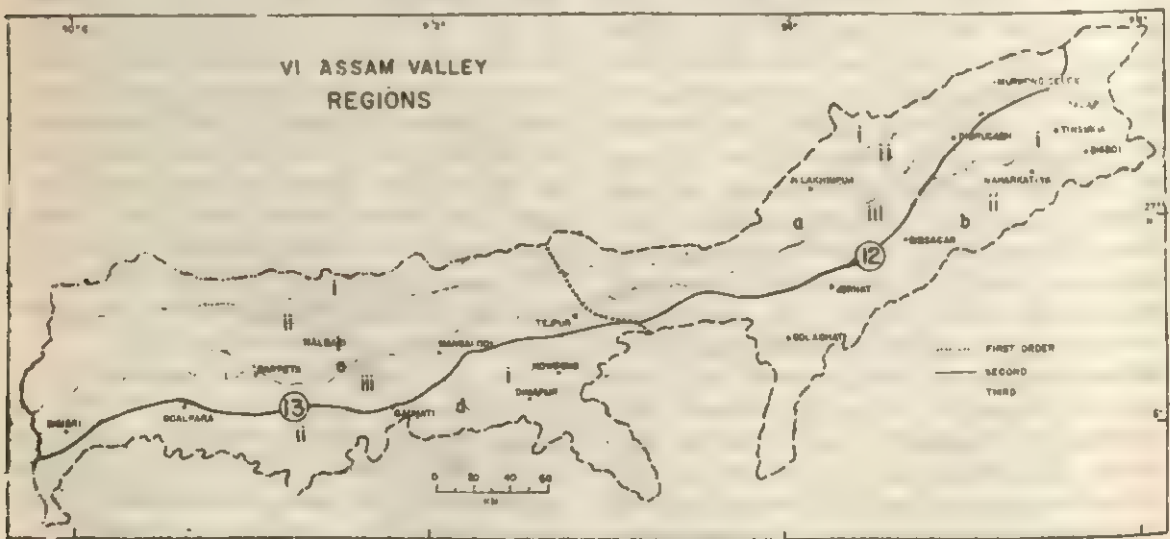


Fig. 7.20

but also to tea plantation. While rice occupies the new alluvial soil tracts immediately adjacent to the river Brahmaputra and its tributaries, tea occupies the old alluvium with greater acidity in the areas lying above the usual flood level and away from the Brahmaputra river. Tea and rice account for about 90% of its sown area while sugarcane, oil seeds and pulses are supplementary to these two major crops. This area experiences higher rainfall and relatively low temperature and has undoubtedly a more comfortable climatic condition than its counterparts in the rest of the Assam valley. The effective precipitation owing to higher rainfall and relatively low temperature has supported the luxuriant growth of evergreen, semi-evergreen and wet-deciduous forests which have an added importance to the economic potentiality of the area. Although the resources such as tea, oil, timber and some amount of coal have been exploited since only less than a century yet the area was the first in the whole of Assam to receive the impulse of industrial and commercial activities.

The right and left bank regions of the Bhramaputra in the Upper Assam Valley differ in their genesis as well as the economy, the former being a region of rather backward agricultural economy with fertile soil and frequently changing river courses while the latter has a mixed economy, i.e., agricultural-cum-industrial. Moreover, the Brahmaputra is an effective divide between the two regions because of the absence of any river bridge to join the two. It renders possible the division of the Upper Assam Valley into two second order units, i.e., *a*. Upper Assam Valley North and *b*. Upper Assam Valley South.

Upper Assam Valley North is an elongated stretch of land including the parts of Tezpur and North Lakhimpur sub-divisions lying between NEFA Himalaya and the Brahmaputra. It is a region of fertile soils which, associated with adequate rainfall, renders a high agricultural potentiality to it. But the proper agricultural land-use receives a recurring setback through the devastating floods and frequently shifting courses of the innumerable streams des-

cending from the NEFA Himalaya. It has also hampered the development of settlement and transport net. Recently, the rail link has been extended eastward from Rangapara through North Lakhimpur up to its eastern border at a considerably high cost owing to the construction of the innumerable bridges and culverts. The consequent recognition of the geopolitical significance of the area after the Chinese aggression has certainly accelerated the development of transport facilities and, as such, a trunk road has been completed almost parallel to the railway track and it sends feeder arms into the NEFA as well as to the market centres and the towns along the Brahmaputra. Industrial landscape is marked by limited number of tea factories, saw mills and some agro-based industries. Lack of industries is the result of the so far under-developed means of transportation and power, and absence of mineral resources and enterprise. In addition to rice and tea, the area also grows sugarcane. The urban centres worth mentioning are Tezpur and North Lakhimpur.

This region has three longitudinal belts which make perceptible the three third order regions as *a* (i) the foothill belt in the north, *a* (ii) the higher belt of silt and *a* (iii) the Brahmaputra Khadar.

Upper Assam Valley South is the region where the traditional agricultural economy has been supplemented with the industrial and plantation agricultural economy to a greater extent than in any other part of the Assam Valley. As a result, it is relatively more developed and urbanised. The region, owing to its mineral-oil potentials, was first to receive attention of the Government and hence could be brought on the road and railway map of the country earlier. Rail, road and air connections had been extended to the eastern limits of the region. Dibrugarh (58,480), Digboi (35,028), Tinsukia (28,468), Naharkatiya (18,877) etc. emerged as the oil towns; Jorhat (24,953), Sibsagar (15,105) etc. represent the administrative centres since early periods. On the whole, the relatively recently developed eastern section has some difference in its economic set up and as such the Upper Assam Valley South can be divided into two sub-units,

i.e. *b(i)* Dibrugarh-Digboi Region and *b(ii)* Jorhat-Sibsagar Region, roughly along the border of the Lakhimpur and Sibsagar districts. The town of Sibsagar is of greater cultural and historical interest, particularly associated with the Siva culture. Dibrugarh is the scene of ceaseless conflict between man and the Brahmaputra. Following the swallowing up of about one third of the town by the Brahmaputra consequent to the earthquake of 1950, more attention is being paid towards fortification of embankments and construction of abutments and piers.

Lower Assam Valley comprises of Goalpara, Kamrup, Nowgong districts and Mangaldoi tahsil and western fringe of Tezpur tahsil of Darrang district. The region is basically dominated by an agricultural economy with a diversified cropping pattern comprising pulses, oilseeds, sugarcane, potatoes, tobacco and jute, in addition to the major crop, rice. Recently, wheat has been introduced in the relatively drier eastern part of the region. Tea and mineral resources do not occupy important place in the economy of the region, while commerce is also subsidiary.

Unlike the Upper Assam Valley this region does not possess monotonous physiographic characteristics since its landscape is interspersed with spurs of the Meghalaya plateau. Some of the outliers of the Meghalaya are found even to the north of the Brahmaputra as isolated monadnocks. The climate of the area is considerably different from the Upper Assam Valley, with relatively lesser amount of rainfall and high temperature which have led to the growth of mixed deciduous forests highly characterised by the valuable species *Sal* but with a significant absence of evergreen or semi-evergreen forest owing to less effectiveness of precipitation. Teak has recently been planted in the eastern part. The riverain plain in the foot hills of Bhutan which forms the northern border of the Lower Assam is characterised by riverain forests, comprising *Sisoo*, *Kabir* and *Simul* trees.

The industrial activities of this area are mainly confined to its major town, Gauhati, and are based either on its agricultural and forest resources or on imported raw materials from in-

side and outside the State of Assam. Other centres worth mentioning are Hojai and Lumding (rice mills), Silghat (jute mill) and Jagiroad (spun-sill mill). The area has a better accessibility with the rest of the country and, as such, the development of manufacturing industries mainly in Gauhati to cater for the needs of the area and its neighbourhood has been more conspicuous than in the other parts of the valley.

Like the Upper Assam Valley, the Lower also has physiographic and economic distinctiveness in the plains along its two banks. The number of transverse streams, almost parallel to each other, is rather the highest on the right bank which, on regional scale, presents the well-developed, structurally controlled trellis pattern; while the left bank tributaries of the Brahmaputra present lower density and dendritic pattern. Swamps and mars are numerous in the right bank region but it has the advantage of greater contacts with the Great Plains of India. Though the Brahmaputra no longer forms an effective barrier between the northern and southern counterparts owing to the river bridge at Gauhati, yet the Lower Assam Valley can be conveniently divided into two second order regions mainly on account of varying terrain features; i.e., *a*. Lower Assam Valley North and *b*. Lower Assam Valley South.

The Lower Assam Valley North is characterised by agricultural economy based on rice and jute culture. The region had been provided with rail and road transport earlier than elsewhere. Most of the towns of this region are of post-Independence period. The pre-Independence urban population is represented by 4 towns, Dhubri (28,355), Barpeta (22,207), Nalbari (9,285) and Mangaldoi (8,547). The trend of urbanisation itself reflects upon the developing nature of the area. Among the regional variations, i.e., groundwater condition, soils and the resultant factors help the delineation of the second order regions into three parallel belts similar to its contiguous part in the Upper Assam Valley, i.e., *a.(i)* The foothill belt where sub-artesian conditions prevail and luxuriant growth of evergreen vegetation predominates, *a.(ii)* the higher belt

of silt, the region of maximum development and *a(iii)* the Brahmaputra *Khadar*, a zone of frequent siltation and purely agricultural economy.

The Lower Assam Valley South has relatively stable economy with higher belt of silt extending more widely so as to restrict the *Khadar* belt which is extensive enough in the north to mark a distinct sub-unit. The impact of the towns like Gauhati (100,707), Nowgong (38,600) etc. is well marked as these urban centres have developed light consumer goods industries, primarily to cater to the needs of the local inhabitants. Jute cultivation and jute industry are significant in this region. Economic and climatic variations are rather more pronounced east-west than north-south and hence this region can be conveniently divided into *b(i)* the relatively drier eastern section dominated by rice-tea and jute culture alongwith the recent introduction of wheat, commerce standing next to agriculture in the area; and it can be named as Nowgong region; and *b(ii)* the humid west, with rice-jute culture and industrial occupation replacing the commercial activities, which can be called as Gauhati region. Recently, an oil refinery has been established at Nunmati near Gauhati where crude oil is piped from the Upper Assam Valley. This is indeed a significant addition to the industrial landscape of the region.

Problems and Prospects

As is evident from the foregoing, the Assam Valley seems to be a land of promise with its extensive, although not so varied, physical resource base, but it offers as much of challenge as opportunity. The Brahmaputra system makes it a region of plenty with its extensive agricultural, forest and hydro power resources and cheap, long-route water transportation, but the excess of water is the biggest menace throwing life off-balance, particularly in the rainy season. The floods are annual recurrence and because of the nature of terrain they pose great dangers to agricultural crops, settlements and the transport and communication systems. The solution of the flood menace through such economic uses of the huge water potentials as building multipurpose reservoirs for water power, irrigation

and fishery development and for transportation, would go a long way to stabilize life in the valley and to provide for future development measures. The remedial measures so far undertaken are confined to the construction of about 260 km of dykes in the most vulnerable parts of the Brahmaputra river.³⁵ Construction of spurs, both wooden and stone, has also been undertaken to protect the erosional onslaught of the rivers at Dibrugarh and Gauhati. The dykes have been found inadequate for the purpose and have also caused water-logging.

Since the construction of reservoirs and flood control drains would take considerable time to materialise, other short-time measures, like the construction of dykes, permeable river screens, drainage outlets etc. should be taken up as a continuous process. In addition, schemes to regulate the channel flow need also be taken up. In this connection it may be mentioned that a commission in the name of the Brahmaputra Valley Commission has been set up (24th July, 1970) with a primary objective of controlling the floods in the region.

The vast and varied forest and jungle resources are not extensively tapped though potentially most important. It awaits not only development of means of transportation, forest-based industrial developments and afforestation schemes but also measures for the eradication of malaria, etc.

The valley is one of the agriculturally under-used land of India and at least 6 to 8 percent of the total surface can be further brought under agricultural landuse by reclamation of some of the marshes and swamps and accessible reed-jungles. Further, steps need be taken for modernisation and diversification of agriculture through intensive and multiple cropping, introducing HYV crops, stabilizing agricultural settlements through flood control and providing transverse transportation channels and, above all, by creating storage and rural service centres. The development of pastures on marginal lands and fresh water fisheries is also required for a diversified economic set-up as it will provide extra employment and income to the people and a balanced diet as well.

industries are few and far between. The transportation isolation of the valley, and lack of encouragement for any outside capital investment are the main hindrances in the industrialisation of this region. The provision of industrial estate sites, adequate and sustained supply of power and raw materials, development of transport and marketing facilities and tax concessions for at least the gestation period are necessary to break the deadlock of industrialists to come to Assam. Cheap hydel and gas power can attract such power-oriented industries as fertilizers, bamboo and reed-based paper and pulp, cement

depending on limestones from the hills and chemicals and petro-chemicals based on Upper Assam oil fields.

Recently the Regional Research Laboratory at Jorhat has developed a process for the production of carbon black, a major ingredient of rubber and tyre industry. The low ash coal reserves (5,000 million tonnes) are sufficient for a large scale industry and the carbon black can be produced at much lower cost (about Rs. 680/- per tonne) than the imported cost (Rs. 1,500/- per tonne). It will serve the twin object of import substitution and export promotion.

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The Himalaya Mountains

With their physical enormity and environmental complexity the Himalaya have set the Indian way of life over the centuries by providing the dales and glens of peace and tranquillity for sublime thinking. Kalidas has well expressed what the Himalaya mean to India.

God of the distant north, the Snowy Range
O'er other mountains towers imperially;
Earth's measuring-rod, being great and free from change
Sinks to the Eastern and the Western sea.....

The Kashmir Region ($32^{\circ}17'-37^{\circ}5'N$ and $72^{\circ}40'-80^{\circ}30'E$) occupies a strategic position in India with its borders touching Afghanistan in the N.W., Pakistan in the west and China and Tibet in the north and east. The vale of Ab-i-Panja, the Panhandle (Wakhan) of Afghanistan, separates India from the U.S.S.R. The major world powers keep up their deep interest in the region mainly because of its strategic location. The Kashmir region as a whole covers an area of 2,22,800 km², but with the declaration of the Cease-Fire Line (1-1-1949), 83,808 km² of the area has gone under the illegal and forcible possession of Pakistan, and since 1962, 41,500 km² of the area has been occupied by China through aggression.

Through Kashmir passed one of the main routes of cultural and commercial intercourse between India and the Central Asia during the ancient times. It is over the majestic heights of its snow-capped mountains that several passes occur providing caravan routes to the Central Asia; notable among these are the Karakoram pass (5,575 m) in Ladakh, Burzil pass (4,199 m) in Gilgit and Babusar pass (4,173 m) in Chilas. Lhasa is linked with the Kashmir region by Lanak La (5,486 m) in Ladakh which is linked with the valley through the Zoji La (3,529 m). The north-western region of Gilgit and Baltistan has more massive mountains. Within a radius of 112 km of Gilgit town, there are 21 peaks over 6,000 m. This region has Nanga Parbat (8,126 m), the "Land of Mountains". The northeastern portion of Ladakh has an average elevation over 6,000 m; here on the Karakoram range K₂ (8,611 m) is next highest peak of the world.

The most important part of the region is the Kashmir valley, which is an oval "dun" of tec-

tonic origin. "On a relief map the valley of Kashmir looks like a white foot-print set in a mass of black mountains." In the Kashmir valley R. Jhelum is navigable between Khanabal and Sopore for about 100 km. The valley is surrounded by the Great Himalaya (Himadri) and the Pir Panjal with 12 passes of importance : Banihal (2,832 m), Zoji La, Deosai (3,765), Burzil Kamri, Babusar, Janod, Kepan, Tithwal, Hazipir, Baramula and Pir Panjal (3,494). The valley supports 43.1% of the population of the whole region over about 6.8% of the area.

The Kashmir region is the most strategic region in the entire Himalaya, not only for India, but also for the continent of Asia. If Pamir is said to be the roof of the world, Kashmir is the crown of India.

Culturally, the Kashmir region is a zone of convergence and diffusion of mainly three religio-cultural streams—Hindus, Buddhists (Tibeto-Mongoloids) and Muslims. These culture groups still maintain their regional expression in three distinct sections of the region : the Jammu region is overwhelmingly Hindu, Ladakh, Buddhist while Gilgit, Baltistan and Poonch are mainly Muslim; the valley, however, has been a zone of convergence of the cultures and provides a link functioning as it does as the nerve centre of the region.

The Kashmir region within the Cease-Fire Line is administratively divided into three provinces and nine districts, viz. (i) Kashmir province covering Anantnag, Srinagar and Baramula, (ii) Jammu province comprising Doda, Udhampur, Jammu, Kathua and Poonch and (iii) Ladakh. Beyond the Cease-Fire Line are the districts of Gilgit and Gilgit Wazarat, Tribal Territory, Chilas, Muzaffarabad, Mirpur and

part of Poonch, which are the constituent parts of the Kashmir region (Fig. 8.1).

Historical Background

The real history of Kashmir begins with Kashyapa, chronicled in the famous work, *Rajatarangini* of Kalhana Pandit (A.D. 1079-1151). According to him, Kashyapa was the pioneer king of Kashmir. Then this region was known as *Kashyapamar* which gradually changed to Kashmir.

At first, the valley was inhabited during summer only due to severe winters when the people used to move down to the plains. It is stated that before the draining operation of the Great Lake occupying most of the present vale, the climate in winter was so cold and snowfall used

to be so heavy that the habitable parts of the valley consisting mostly of mountain slopes could be occupied by nomads only who migrated along with their herds of cattle southward. That the lacustrine deposits of the valley are by far older than any monument of man discovered so far, proves that the basin of Kashmir contained a very large lake which was drained out gradually through Baramula. It was Kashyapa who brought the major radical change from nomadism to settled life.

The Aryans of Kashmir had developed a style of their own long before the Ashokan period when Buddhism established its foot-hold here; it signifies that civilization had attained a remarkable excellence in the valley of Kashmir



Fig. 8.1

where society was based on a sound and self-contained agricultural economy.

According to *Rajtarangini* the village Pandrethan which is about four km to the south-east of Srinagar was then known as Puranadhisthana or Srinagri founded by Ashoka the Great. The name Srinagri, meaning the city of *Sri* or *Lakshmi* (goddess of wealth) was assigned to the capital city to commemorate the Buddhist monastery said to have been built by Ashoka between Pandrethan and the nearby steep hill-side. Since then the present Srinagar has enjoyed the status of principal city of the region, and irrespective of the dynasties, it has remained the capital city and the regional centre.

It was Ashoka who introduced saffron cultivation at Pampore and when other efforts were also made to improve agriculture.

The Brahmins of Kashmir were great admirers of Buddhism and about 100,000 people of Kashmir adopted Buddhism during Ashokan period. It is said that there were 500 monasteries in Kashmir at that time. The Buddhist creed continued for long time in the valley without any antagonism with the Brahmanical cult. From the valley the Buddhist culture spread to Ladakh, Tibet, Central Asia and China. In keeping with the traditions of co-existence and tolerance, the Buddhism continued in Kashmir till the Muslim conquest.

The famous Chinese pilgrim, Huen Tsang, visited the valley of Kashmir in the middle of the seventh century when he found agriculture a settled occupation of its inhabitants. Rice, fruits and flowers were grown in the valley of the river *Vitasta* (Jhelum). The Moghuls are said to have introduced the village-level revenue system into Kashmir towards the close of the 16th century. Joint responsibility in certain matters, such as payment of land revenue was introduced by Todar Mal during the rule of Akbar when arts and crafts also received much fillip. He built the fort known as Hari Parbat as a famine relief measure. During the time of Jahangir the famous garden of Shalimar was laid out. He introduced the *Chinar* tree plantation to the valley from Iran; he also gave en-

couragement to the plantation of forests and developed some cottage industries.

The modern history of Kashmir starts with the Dogra* dynasty when Maharaja Gulab Singh got the Jagir of Jammu from Maharaja Ranjit Singh in the year 1820. In 1822 Raja Gulab Singh became the full-fledged Raja of Jammu. On 16th March, 1846 Kashmir was sold to Gulab Singh by the treaty of Amritsar for Rs. 7.5 million. By this deed the area situated east of the Indus and west of the Ravi, excluding Lahore, was handed over permanently to him by the British. It was Maharaja Gulab Singh who integrated Jammu with Kashmir into one political unit, which since then is known as the State of Jammu and Kashmir. The valley of Kashmir functioned as the economic and political nerve centre of the whole of the State. Along the rims of the valley tribal chieftains remained potent forces though they often continued to remain under the suzerainty of kings of Kashmir; notable amongst these are the chiefs of Hunza, Kishtwar, Gilgit, Ladakh, etc.

Maharaja Gulab Singh administered the region with great vigour, foresight and determination and brought the principle of benevolent personal rule to perfection. During the Dogra Dynasty complete peace prevailed which helped open the valley for trade and tourism. During this period the roads to the mountain interior across the Pir Panjal (the Banihal cart road) and the Jhelum valley road to Kohala were built.

The preservation and utilization of forests, manufacture of drugs, establishment of woollen manufactures, arts and crafts of Kashmir from papier machie to wicker willow, were the significant achievements, alongwith the compulsory education and legislation to protect the interest of peasants and establishments of major industries in wood, silk and wool which increased the prosperity and tempo of transport and trade. There was a considerable trade carried on between India and Yarkand across the trade route through

* The term is derived from the ancient Dwigarta Desa—the land between two furrows (Dwi garta), one of the Ravi and the other of the Chenab.

Leh to Tibet and Central Asia. All wool for shawls in Kashmir came from Ladakh and Tibet.

The political entity of the State as built by Maharaja Gulab Singh and maintained by his successors came to an end in 1947. After 15 months of undeclared war between India and Pakistan, on January 1, 1949, India Government ordered the cease-fire without pushing out the Pakistani invaders beyond the region, and took the case to the United Nations.

The region is an integral part of India with an elected representative government headed by a chief minister. The overall administration is vested in the Governor, appointed by the President. The jurisdiction of the Supreme Court extends here too, as in other parts of India.

The geographical basis of Kashmir as a region is sound, physically, economically and culturally; the economic development of the region needs integration of all the units which are bound together by the tenets of complementarity. Spate's plea¹, as such, has little geographical relevance to-day as river basins seldom form single political units anywhere in the world. And, if this plea has any relevance, the Low Countries should control the Rhine valley, the life-line of several countries. Politically too, Kashmir is an integral part of India and unless and until such areas of Kashmir which are not within our control are integrated for development, they will have to undergo the pangs of isolation.

The Physical Setting

Kashmir adorns like a crown the physical personality of the country. It is in this part that the country raises its head in latitudes situated far beyond the upper bounds of the tropical zone, even the lowest latitude ($32^{\circ}17' N$) in Kashmir is much higher than the highest ($29^{\circ}30' N$) in the NEFA (*Arunachal*). Predominance of majestic mountain ranges with snow-clad peaks, large longitudinal valleys of subsequent streams occupying deep gorges, transverse gorges cut across the ranges by antecedent streams, strategic mountain passes facilitating transportation arteries to run across the otherwise non-negotiable high ranges, dearth of extensive alluvial plains, preponderance of glaciers and patches

of snow-fields, plateau-like features developed in thick accumulations of the Pleistocene glacial moraines (locally known as *Karewas*), the Kashmir valley occupying a somewhat flexure basin but quite singular in its natural beauty, and numerous glacial lakes, are some of the characteristic features of Kashmir.

A somewhat northerly detour of the general trend of the Himalayan ranges is well pronounced in Kashmir. In the making of the region, the impact of the northward tongue-like projection of the basal peninsular rocks was probably responsible for this detour in the general trend as well as for the syntaxial bend of the N.W. Himalaya. The prominent thrusts and nappes, found in the area, vividly reveal the complete geological history of the region right from the pre-Cambrian age. A complete stratigraphical record of sedimentation is maintained. Representative rocks of all periods from the Archaean up to the Recent have outcropped in this region. The region did experience quite vigorous, though intermittent, volcanic activities till the Upper Triassic period. Granites have been intensively injected into and extruded materials have buried a lot of the sedimentation that preceded.

Geology

The geology of Kashmir region preserves a chronological record of the great Alpine orogeny as well as of the sedimentations, tectonics and vulcanicity that followed the Himalayan orogeny. Besides displaying on its surface the rock specimens belonging to all ages, beginning from Archaean complexes which formed the floor of the Himalayan geosyncline right up to the Recent alluvium, the region also exhibits remnants of glacial deposits at lower altitudes as a testimony of climatic changes in the past. Evidences of dynamic structural deformations like folds, faults, thrusts, nappes and huge igneous intrusions are also found. As far as geological evidences are concerned, much is displayed on the surface, more is concealed in its womb.

Even the axis of folding is not so simple in this region. The great N.W. Himalayan syntaxis around the Nanga Parbat is typical of its kind. The entire bundle of mountain folds has

been acutely reflexed. On the west of this syntaxis, the strike swings to a N-S trend in Hazara and continues so up to Gilgit. From Gilgit it takes E-W trend. To the south-east of this syntaxis, the main strike has the general N.W.-S.E. trend through the Astor and Deosai. At the syntaxis, all geological formations appear to have taken a sharp hair-pin bend as if some sharp pivotal obstruction forced them to bend round it.

There are three prominent and well-recognised thrusts in this region—the Murree thrust, the Panjal thrust and Zaskar thrust (Fig. 8.2, Inset). The Murree thrust exhibits a greater vertical displacement and is comparatively much more steep than the Panjal and the Zaskar thrusts. The Panjal thrust

has the least inclination being almost horizontal. On the basis of tectonics the region can be divided into three principal structural zones—the Foreland, the Autochthonous fold zone and the Nappe zone. The foreland base is almost a peneplain. It consists of two belts: the Siwalik belt is characterised by open simple folds and reverse strike faults while the Sirmur belt comprises more tight folding and steeper strike faults. The Autochthonous belt includes rocks of the Carboniferous to the Eocene age having undergone recumbent-type folding. This belt has been thrust over the foreland which underlies the Murree series. The Kashmir nappe² is mainly composed of the pre-Cambrian Salkhala series overlain by the Dogra slates. These rocks

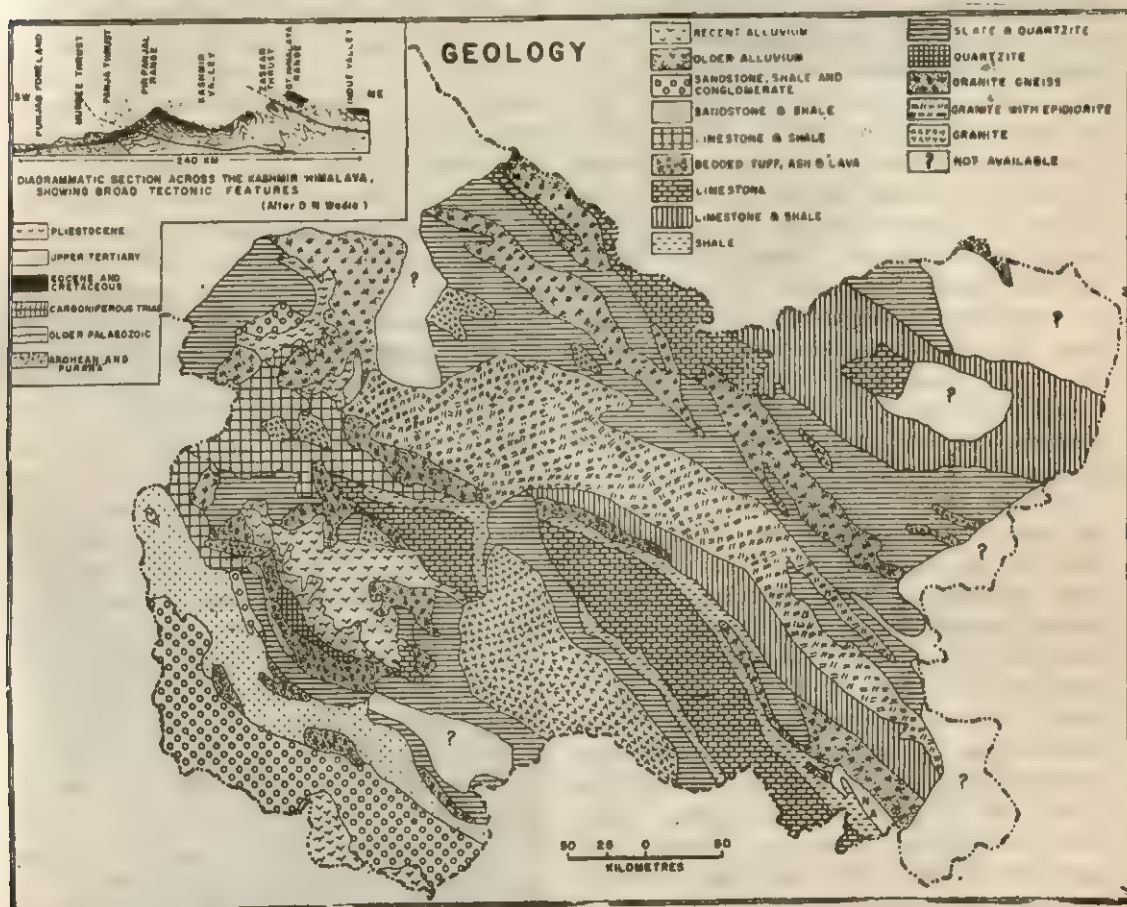


Fig. 8.2

form the floor of the great geosyncline that has moved almost horizontally along the Panjal thrust. In different parts of the Kashmir region the Salkhala series and the Dogra slates are overlain by Palaeozoic and Triassic deposits. The principal geanticline within the Himalayan geosyncline forms the root zone of the Kashmir nappe. It is mainly composed of the Archæan and pre-Cambrian formations intruded by several granitic masses. The different phases of the Himalayan orogenesis were associated with various phases of granitic activity, some of which were post-Cretaceous.

The great basement complex of the Himalaya consists of three elements—(i) the metamorphosed sedimentary Archæans, (ii) intrusive granite and Gneisses of later periods, and (iii) remnants of Archæan granites, gneisses and schists. These crystalline rocks mainly occur in the Zaskar range and in the region lying farther north, e.g. in Gilgit, Baltistan and Ladakh. North of the Zaskar their outcrop becomes very wide covering almost the whole of the region up to the Karakoram. These rocks are not a significant component of the Pir Panjal range. Here they occur in minor intrusions. In the Kaz Nag, the trans-Jhelum continuation of the Pir Panjal range, there is a larger development of the crystalline core. A broad area of Kishtwar is also occupied by these rocks. The largest occurrence of hornblende granite is in the mountains between the Astor and Deosai (Fig. 8.2).

The rocks of the Dharwar, the oldest sedimentary system, have been designated as Salkhala series in the Kashmir area. They consist of slates, phyllites, schists, quartzites, crystalline limestones and dolomites and occur between the central crystalline axis of the Himalaya and the outer ranges. They occupy tracts of North Hazara, Indus Kohistan, Gilgit, Ladakh and the Zaskar range. The great Himalayan range, west of Ladakh, is largely composed of Salkhalas converted into para-gneiss. The Nanga Parbat massif is wholly built of the series. South of this range the Salkhalas show lesser degree of metamorphism and thus clearly reveal their sedimentary characters. The Dogra slates occurring in

the south-west flanks of the Pir Panjal, represent the rocks of Vindhyan system in the Kashmir Himalaya.

Ellipse-shaped elongated patches, situated north of the alluvial part of the valley, contain fossiliferous Palaeozoic rocks of Kashmir. It stretches from north-west of Hundawar to the south-east end of the Kashmir sedimentary basin. The Liddar valley development is the more typical. The longer axis of the ellipse trending N.W.—S.E. coincides with a broad anticlinal flexure in which the fossiliferous Palaeozoic rocks are folded. As a result of denudation, the Cambrian and Ordovician rocks have outcropped in the central parts of this anticline, whereas thinner bands of younger formations—Silurian, Devonian and Carboniferous successively flank them on the either side. A somewhat similar outcrop is found in the Basmai anticline of the Sind valley between Sonamarg and Kolahoi. Palaeozoic rocks have also outcropped in the synclinal basin from the Wular lake to Tithwal.

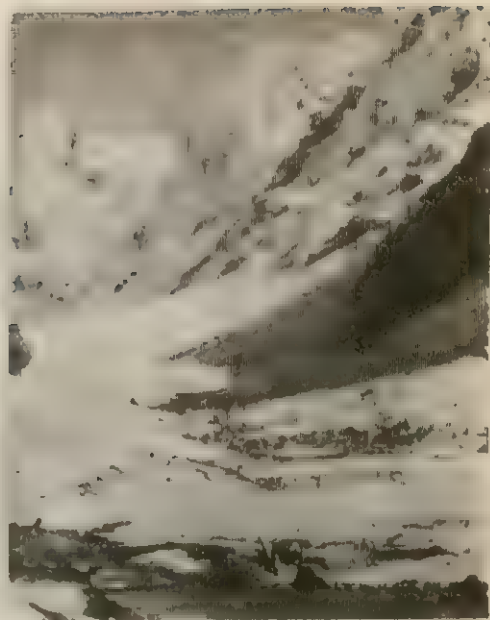
During the Carboniferous period, the Kashmir area was converted from a region of quiet marine sedimentation into a great theatre of vulcanicity. The volcanic products buried large areas of Kashmir under 2,100-2,400 m of lavas and tuffs. The volcanic activity was most intense during the Permian period after which it diminished. A isolated centres, as in Gurais, it persisted till the Upper Triassic period. The Panjal traps are conformably overlain in several parts of Kashmir by a series of the Gondwana plant-bearing beds. The beds are overlain by Permian Limestone. Within the sub-Himalayan zone of Jammu, unfossiliferous limestone of Permo-Carboniferous age crop out in a chain of inliers extending from Riasi to the Poonch valley. Fossiliferous Permo-Carboniferous limestones are observed extensively in the Karakoram.

Of the Mesozoic systems, the Trias is the best and most fully developed. The Jurassic and Cretaceous outcrops are few and mostly confined to the mountains of Ladakh, Zaskar and Hazara.

All the Tertiary systems are fully represented in the outer mountains. Tertiary beds are also found in the Indus valley.

PLATE VII

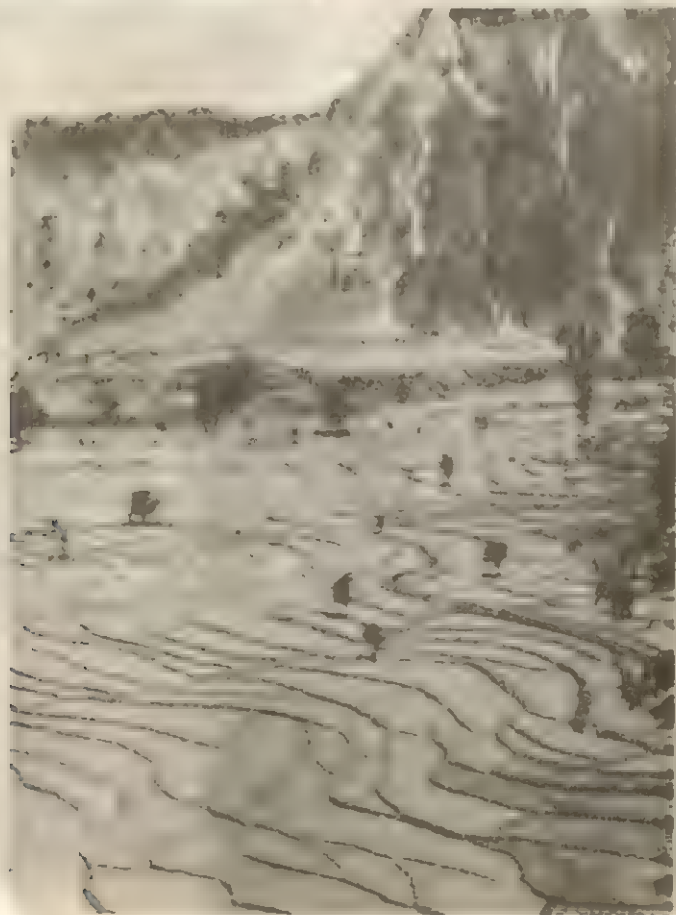
A view of Sonmarg Valley (Kashmir)



A view of Pahalgam (Kashmir)



Rural House, Kangra Valley



Terraced fields and Kuhl irrigation, Kangra Valley

The *Karewa* formations of the Kashmir valley belong to the Pleistocene Ice age. Following sequences of *Karewas* according to de Terra² are well marked.

First interglacial—Lower *Karewas* deposition (c. 600 m), lake beds, fluvial in wash and eolian drift.

Second glaciation—*Karewas* gravel (c. 120 m), glacio-fluvial outwash fans.

Second interglacial—Upper *Karewas* (c. 60 m), topmost beds of eolian and fluvial origin; lower beds lacustrine; also fluvial outwash (partly varved).

The vale of Kashmir is an alluvium-filled basin. A large part of this alluvium is of recent formation by the river Jhelum. Recent alluvium is also found in the southern plains of Jammu.

Physiography

The physical personality or the majestic Himalaya, representing a typical fold mountain system prevails over the physiographic details of whole of the Kashmir region. The role of structural control is also well pronounced. The region consists of huge mountain masses interspersed by longitudinal valleys. The mountain ranges represent the anticlines and the longitudinal valleys, the synclines of the main Himalayan folds. The excessive compressive forces active in the folding operation, did not achieve the resultant crustal shortening only by way of folding but thrusts and nappes also developed in the process.

In the whole region there are four larger mountain ranges—the Karakoram, the Ladakh, the main Himalaya or Zaskar, and the Pir Panjal. Between these ranges are the longitudinal valleys of the Gilgit, the Shyok, the Indus, and the Jhelum. South of the Pir Panjal is the Siwalik range comparatively much lower in elevation and known as the Jammu hills; further south there is a narrow strip of foot-hill plains (300 m), 25 km wide, merging into the Punjab plains.

The narrow strip of the plain, bounded by the Jhelum and the Ravi, is situated in the south-western part of Kashmir where it marks the border with Pakistan. Its general slope is towards the south-west and is dissected by the tributaries

of the Chenab and the Ravi. The tract lying between the Chenab and the Ravi is mostly a ravine land, locally known as *Kandi*.

The Jammu hills rise from the Punjab plain with a gentle slope. Attaining an altitude of about 600 m they end abruptly inwards in steep escarpments. Then follows a succession of narrow parallel ridges, trending N.W.—S.E. and separated by more or less broad strike valleys representing basins of subsequent streams (Fig. 8.3). In these hills two typical *duns* are of Udhampur and Kotli. The outer hills are formed of Younger Tertiary rocks and their elevations rarely exceed 1,200 m. The ranges situated more inwards and formed of older Tertiary rocks attain higher altitudes ranging from 1,800 to 2,400 m.

The Pir Panjal, representing the Middle Himalayan ranges consists of higher mountains. Its elevations vary from 3,500 m to 5,000 m. It is characterised by deeply cut valleys and precipitous gorges. The ridges extending in irregular directions appear to branch again and again. There is a marked discordance between the trend of ridges and the strike of the beds. The Pir Panjal trends N.W.—S.E. and continues beyond the region into the Dhauladhar of Himachal. The ridges exhibit steep escarpment towards the plains in contrast to a rather long gentle slope towards the Vale of Kashmir. The mountains have a typical orthoclinal structure. The ranges are composed of highly compressed and altered rocks of different geological periods, from the Purana and Carboniferous to Eocene. The axial zone is composed of the Permo-Carboniferous rocks. The Pir Panjal is considered as the front of the great Kashmir nappe. As many as 12 peaks exceed 3,500 m in elevation. There are three mountain passes across the Pir Panjal—Pir Panjal Pass (3,494 m), Bundil Pir Pass (4,200 m), and Banihal Pass (2,832 m).

The Vale of Kashmir lies between the Pir Panjal and the Himadri. This structural basin, representing an old lacustrine bed, measures 135 km in length, with a maximum width of 40 km. Its floor stands 1600 m above sea level in the Jhelum flood plain. It covers an area of about 4,865 km². The Jhelum flows close to the nor-

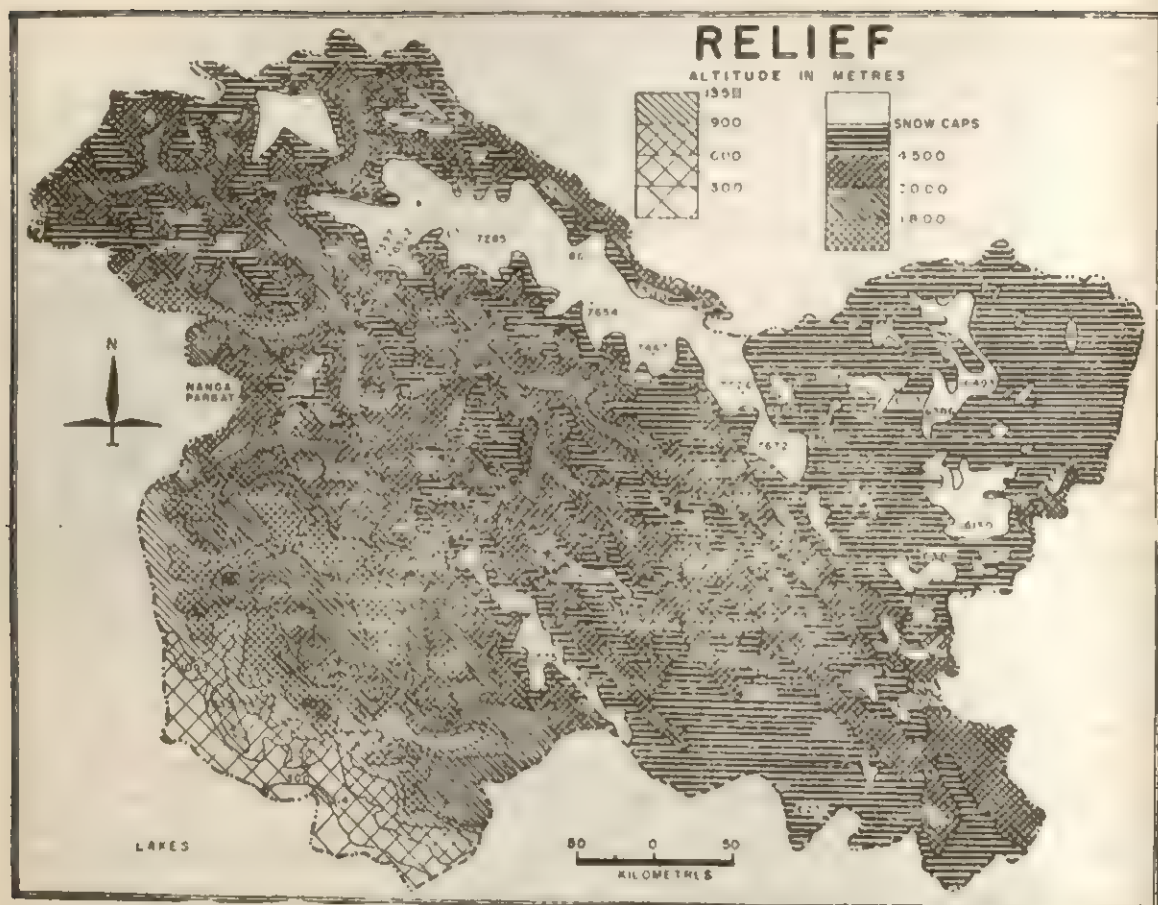


Fig. 8.3

thern side of the vale. Flat-topped terrace-like features have developed in the morainic deposits of the Pleistocene glaciation, the *Karewas*, which are better developed in the southern section of the vale. The *Karewas* are formed of clays, sands, and silts of lacustrine origin and have evidences of several levels represented by bands of marl, loessic silt and conglomerate lentiles. As suggested by de Terra, five main sequences of events are notable : (i) capture by the Jhelum of subsequent stream originally flowing to the SE, probably along the Chenab; (ii) blocking of this exit by the Pir Panjal uplift; (iii) the lake-filling and overspilling; (iv) changes in glacial activity and in the rate of uplift and erosion at the spill-point leading to alternate draining and deepening of the lake and (v) continued uplift acce-

lerating the down-cutting of the Jhelum and the virtual draining of the lake. The Jhelum has greatly eroded the *Karewas* at places leading to the formation of great bluffs and terraces (up to 140 m high). It is accessible from the Punjab plains through the two famous passes, the Pir Panjal Pass and the Banihal Pass. The construction of the Jawahar tunnel during the post-Independence period has opened the valley all the year round.

North of the Vale of Kashmir are situated the great Himalayan ranges including the well-known Zaskar Range, which is bounded on the north by the deep gorge of the Indus. The axial portion of this Great Himalayan Range represents the famous geanticline of the Himalayan geosyncline. It is in this region that the core consisting of the Archaean complex crops out. At its wes-

tern end near the Indus bend stands the mighty Nanga Parbat attaining an elevation of 8,126 m in its highest peak. In this Great Himalayan Range as many as 13 peaks exceed 6,000 m in elevation. A still larger number of peaks range from 4,500 m to 6,000 m. On the northwest slopes of the towering Nanga Parbat glaciers appear in great numbers and of large dimensions. The Diyamir descends to a level of 2,800 m above the sea near the village of Tarshing. The famous Amarnath cave is situated south of the Zoji La in the upper reaches of the Sind Valley. The transverse gorges of the streams, dissecting the slopes of the huge mountain ranges, serve as main transportation lines, usually suitable for pedestrians and pack animals. Some of the important passes in the Great Himalayan ranges are—Zoji La (3,529 m), Chilung La (4,401 m), Uma-si La (5,294 m), Sersank Pass (5,716 m), Poat La (5,716 m), Singo La (5,097 m), Bara Lacha La (4,891 m), Kanzam La (4,551 m), Rohtang Pass (4,631 m), Fotu La (4,094 m), Ruberung La (6,401 m), Sir Sir La (4,990 m), Burji La (4,816 m) and Lanak La (4,964 m). Some of the other notable passes are : Kunji La, Singi La, Polokongka La, Kisgan La, Thit Zarbo La, Salsai La, Photi Pass, and Boizardin La. The hot spring, situated 4,500 m above the sea level, quite close to Puga, about 11 km north of the Kiagar Tso in Rupshu is worth mentioning.

The eastern section of the Zaskar Range in Rupshu consists of intricately ramifying glaciated ranges of crystalline rocks. These ranges are intersected by high glaciated valleys with restricted drainage into a few saline lakes and marshes.

The Hazara Range is a Sindhu Par (Trans-Indus) continuation of the Himadri in the north west beyond the Indus Gorge around the Nanga Parbat. It is similar to the main range in structure and physiography. There are as many as 17 peaks ranging in elevation from 4,500 m to 6,000 m. Dadarili, Shaghichi, Baregah and Kinejut are the important passes across the range and its main offshoots.

The Ladakh Range is situated between the Indus and the Shyok rivers. It forms a prominent range in the Trans Himalayan region. It

stretches from the Shyok-Indus confluence up to the western border of Tibet where the Indus bends sharply and cuts through it separating it from the Zaskar Range in Rupshu. It is rather a straight range with a N.W.—S.E. trend, which is typically concordant with the general trend of the Himadri. It is about 350 km long and 50 km wide.

The crest of this wall-like range is almost even, somewhat planated during the past glaciation. The range is mainly composed of crystalline rocks. The streams draining its flanks have cut very deep valleys and present a typical parallel pattern, probably owing to the steep slopes. In all, 9 peaks exceed 6,000 m in elevation, whereas 15 peaks range between 5,000 and 6,000 m. Chorbat (5,090 m), Digar La (5,400 m), Khardung La (5,602 m), Chang La (5,599 m), and Tsaka La (4,724 m) are the important passes across this range.

The Karakoram Range, extending from the Hunza in the north-west to the Shyok in the east for a total distance of more than 400 km may aptly be called the shining crest of the earth, *Vasudha Ka Dhaval Sheersha*. The Pamir, by virtue of its position as a focal knot from which a number of mountain ranges radiate in different directions, has no doubt been justly designated as the 'Roof of the World'. The Karakoram Range, on the other hand, will rather surpass the Pamir in prominence if its physiographic eminence is properly assessed and considered. Almost the entire crest line is covered with perpetual snow with a number of giant glaciers crawling slowly down the slope. Some of these glaciers are amongst the largest in the world outside the polar circles. Its highest peak K², Mt. Godwin Austen (8,611 m), is the second highest peak of the world. Half a dozen more peaks exceed 7,500 m in elevation, all of them ranking quite high amongst the prominent world peaks. Even the mountain passes along its crest line stand higher than Mt. Blanc, the highest peak of the European Alps. This assembly of significantly high peaks is not found in any other part of the world. Even the neighbourhood of Mt. Everest lacks in having an assembly of so many high heads.

The mountain is mainly composed of unclassified crystalline complexes, flanked by Palaeozoic and Mesozoic sedimentaries. These old sedimentary rocks crop out most extensively in the Baltistan region.

Fossiliferous Permo-Carboniferous strata, mainly limestones, are found extensively in the Karakoram Range. The mountains of Gasherbrum, the Golden Throne, and the Crystal and Bride Peaks are built of these limestones. Permian limestones are also found in the Shaksgam valley. Crystalline limestones are found in the Tirich valley in Chitral. The Jurassic Spiti shales are found throughout the length of the Karakoram Range.

From the Karakoram Range five important offshoots, branching out at acute angles from the main range, extend south eastward towards the Indus valley. The Batura Muztagh between the Gilgit and the Hunza, the Haramosh Range between the Hunza and the Shigar, the Saltoro range between Nubra and the lower Shyok and the Saser muztagh between the Nubra and the upper Shyok. The Masherbrum Range extends westward between the Braldu and the Saltoro rivers.

The important peaks of the Karakoram are the Broad Peak (8,056 m), Godwin Austen (8,611 m), Muztagh Tower (7,259 m), Gasherbrum I (above 8,000 m), Gasherbrum II (8,068 m), Rakaposhi (7,788 m), Disteghil Sar (7,885 m) and Trivor (7,788 m). A number of quite large glaciers are found along the southern face of the Karakoram. The Hispar and the Batura glaciers, about 58 to 61 km long, discharge into the Indus, the latter through the Hunza. The Biafo and the Baltoro glaciers, about 60 km long, discharge in the Shigar, a tributary of the Indus. The Siachen glacier, 72 km in length, falls into the Nubra. The Chogolungma and the Rimo glaciers discharge in the Shigar and the upper Shyok respectively. The thickness of ice-stream in the Karakoram glaciers varies from 120 m to 300 m. These giant ice-streams are survivors of the last Ice Age. They, however, do not receive sufficient supply of ice to maintain their volume. The important mountain passes of the Karakoram Range are Hispar Pass (5,352 m), Muztagh P.

(5,700 m), Sia La, Bilatond La, Marpo La (5,611 m), Saser La (5,300 m) and the Karakoram Pass (5,575 m).

The Aksai-Chin region, situated in the north-eastern portion of Kashmir, east of the Shyok, represents a much denuded peneplained surface of an intermontane plateau. It is also known as the Lingtze Tang Plains. The surface stands well over 4,500 m above the sea level with isolated relict uplands rising to elevations of over 6,000 m. Crystalline rocks of Archaean age are no doubt extensively exposed on its surface, but it also preserves the sedimentary layers of Palaeozoic and Mesozoic periods in large pockets. The whole area bears a definite stamp of excessive glacial erosion. A number of salt lakes of various sizes appear dotting the whole terrain. These lakes collect the drainage of their surrounding areas without any outlet. The salinity is continuously increasing. This region is typically an area of inland drainage.

Drainage

The drainage of Kashmir region is quite significant. It possesses some classical examples of antecedent drainage. The Indus takes its origin from the Tibetan plateau and crosses the mighty Himalaya through a deeply cut gorge; the Jhelum originating from the Himadri has crossed the Pir Panjal south of Baramula. Even the rivers of Jammu taking their origin from the southern slopes of the Pir Panjal and flowing across the axis of folding of the Jammu Hills have tackled successfully the recent upheavals of the minor folded ranges in this region. Some of the Himalayan valleys are exceptionally high (more than 3,000 m), where streams are found modifying the glacial valleys. Shyok, Nubra and Shigar valleys are some good examples. Moreover, streams of the Kashmir region have carved out different types of drainage patterns (Fig. 8.4).

The Indus enters the Kashmir region near its confluence with the Gurtang river at a height of about 4,245 m above the sea. South of lake Pangong it takes a sharp turn and cuts through the Ladakh range, which it cuts again a little above the Shyok confluence. Flowing almost straight in a north-westerly direction it is joined by R.

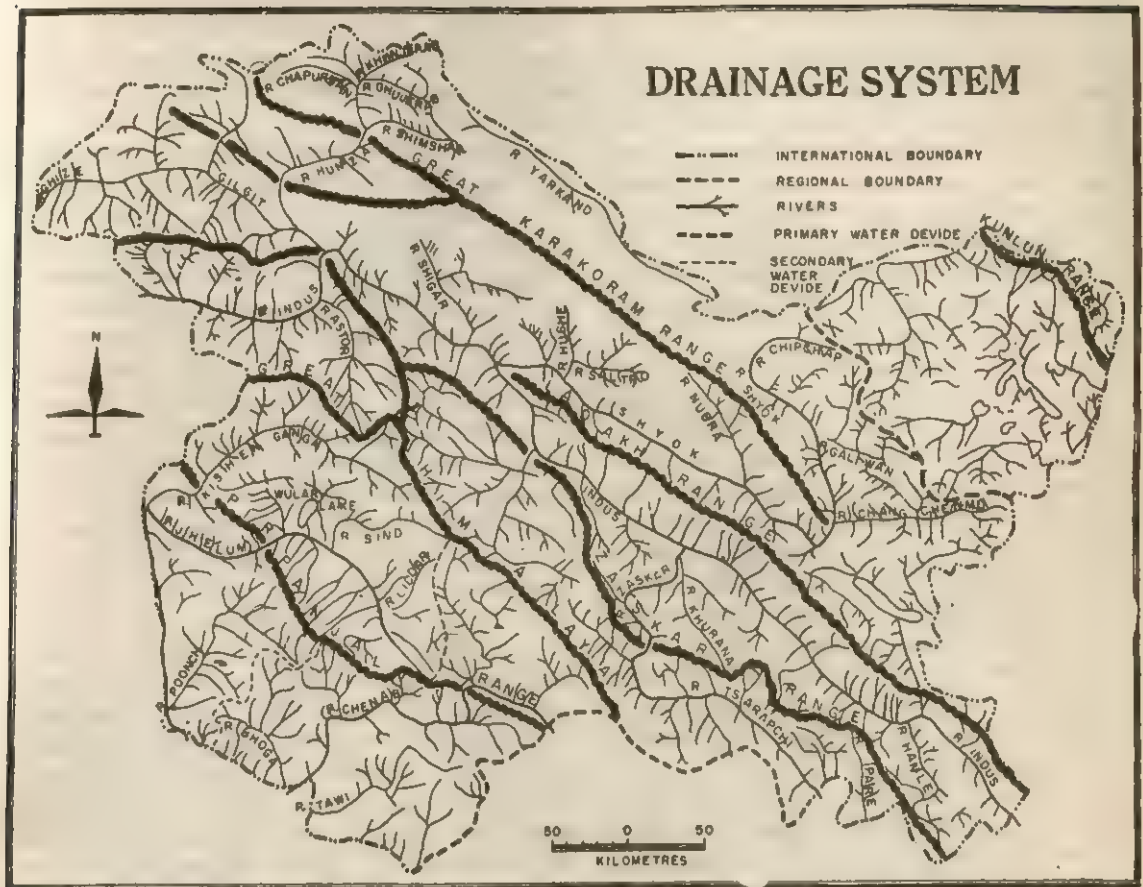


Fig. 8.4

Gilgit at Bunji (1,415 m). In this stretch of about 725 km the fall in the river bed is about 4 m per km. The valley is quite narrow in Ladakh though alluvial flats are found in the extreme east of its Kashmir course. In Baltistan the catchment of the Indus widens. A little before its confluence with the Gilgit, the Indus takes a sharp bend towards the south and near the western flanks of the Nanga Parbat it turns towards the west and leaves Kashmir near Sazin.

The chief right bank tributaries of the Indus are the Shyok, the Shigar and the Gilgit while the important left bank tributaries are the Astor, the Shigar (South), the Zaskar, and the Hanle. The Shyok originates from the Depsang Plain (above 5,000 m), flows westward and reaching the flanks

of the Karakoram Range takes a turn towards the S.S.E. again to take a sharp bend towards the N. W. It thus delimits the eastward extent of the Karakoram. After receiving the Nubra and the Saltoro as its right hand tributaries, the Shyok meets the Indus about 40 km above Skardu. The Shigar draining the melt-waters of some of the famous Karakoram glaciers joins the Indus just opposite Skardu. The Gilgit takes its origin near the N.W. boundary of Kashmir and receives the Ghizar and the Hunza as its right and left hand tributaries respectively. The Hunza originates from beyond the Karakoram Range, which it crosses after receiving Shishal as its left hand tributary. The Astor rises near Burzil Pass and flowing in a north-westerly direction

drains the area lying east of the Nanga Parbat and joins the Indus a little below Bunji. The Shigar (South) drains the northern slopes of the Himadri with its tributaries, the Shiugo, Dras, Suru and Wakha. It joins the Indus opposite Marol. The Zaskar, with its tributaries Doda, Tsarap Lingti and Khurna drains the northern slopes of the Zaskar Range and joins the Indus about 40 km below Leh. The Hanle, a small left hand tributary of the Indus, drains the area lying east of lake Morari in Rupshu and joins the Indus near Loma.

The Jhelum originating from the eastern mountain girdle of the Vale of Kashmir meanders in the Vale, enters the Wular Lake, leaves it near Sopore and flows in a narrow gorge across the Pir Panjal from Baramula to Muzaffarabad, where it sharply turns towards the south making a typical hair-pin bend. Its main right hand tributaries are the Liddar, the Sind and the Kishen Ganga, the former two joining it in the Vale of Kashmir. Within the vale a number of minor streams draining the *karwas* join it as its left hand tributaries. The Poonch is the only important tributary on the left bank of the Jhelum joining it near Dhangrol in the Jammu region.

The Chenab drains the eastern section of southern slopes of the Pir Panjal, the Jammu hills and the foot-hill plains. In its upper reaches in Himachal, a typical annular pattern is developed. The Munawarwali, in the valley of which the famous *dun* of the same name has developed, is the only notable tributary of the Chenab in the region.

Drainage Patterns: Typical trellis pattern has developed in the Zaskar drainage basin, where the streams frequently display right angular bends and right angular confluences. This pattern has also developed in the Hunza and the Gilgit basins but comparatively to a lesser extent. Parallel drainage pattern has typically developed on either flanks of the Ladakh range and along the northern slope of the Pir Panjal. Annular pattern has developed over the Deosai region in the upper reaches of the Shigar. A sort of centripetal drainage pattern has developed over the inland drainage area of the Lingtzi Tang Plain

(also known as Ladakh Plateau) in Aksai Chin. This pattern has also developed around lake Morari in Rupshu. A poor representation of radial drainage pattern is observed around the Nanga Parbat.

The confluences of the Nubra with Shyok and the Shigar with the Indus and those of a few left hand tributaries of the Jhelum below Muzaffarabad present the picture of typical barbed or boathook drainage pattern. The Chenab and its tributaries near Jammu display a typical braided pattern.

Some drainage lines in the eastern parts of the Trans-Himalayan region do suggest somewhat a deranged pattern. Dendritic patterns so common to the Plain are noticeable only in the Astor valley.

Lakes : A number of lakes are found in Kashmir region and majority of them appear to be of glacial origin. In the Trans-Himalayan region the important lakes are Pangong Tso and the Salt lakes of Lingtzi Tang. The latter are diminishing in volumes whereas their salinity is increasing. The important lakes of the east Zaskar region are Tso Morari, Kyum Tso, Kiagar Tso, Startsapuk Tso and Kar Tso. In the Vale of Kashmir the Dal and the Wular lakes are fresh water lakes. Other lakes of the Vale are Anchar, Bod and Locut. These are mostly of riverine origin and are remnants of old abandoned beds or ox-bow lakes. Wular, the largest lake for example, is considered to be an ox-bow lake. Two small lakes, Surum and Mansur lie at the crest of an eroded anticline in the Sub-Himalayan region of Jammu.

Climate

From the Alpine (Ladakh region) to the sub-tropical (Jammu region) are the extreme variants of climate in Kashmir region owing to its location and topography. The sheltered valley of Kashmir, however, exhibits an exception to its surrounding region.

The temperature in the region varies spatially. Leh is coldest (-28.3°C lowest recorded) while Jammu is the hottest. Mean monthly temperature is lowest in January and highest in July except in Jammu where the highest temperature is experienced in June (Fig 8.5). Mean monthly temperature in January varies from -17°C at Dras

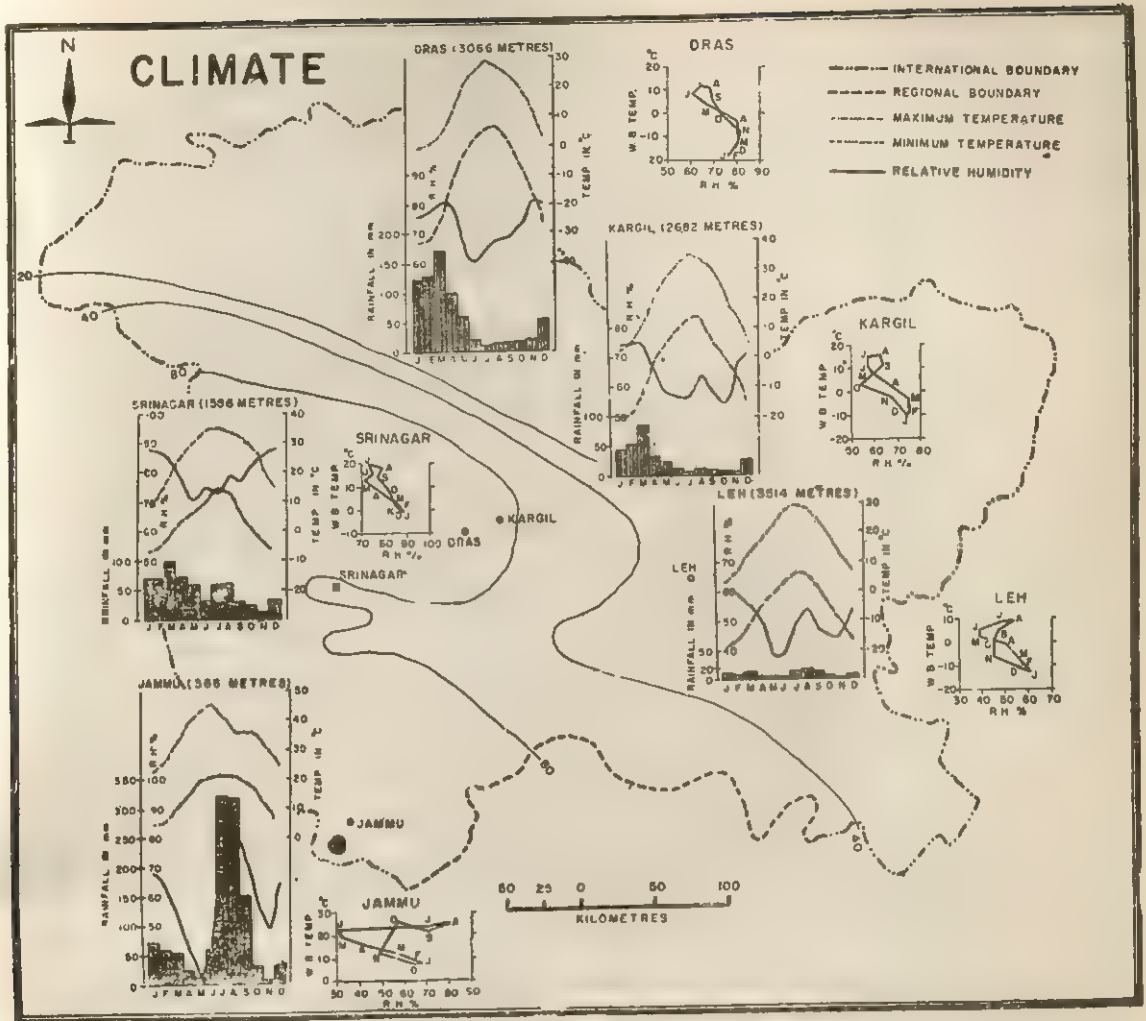


Fig. 8.5

to 14°C at Jammu; Kargil and Leh being other stations of below freezing average. Exceptionally high and low temperatures are notable (47.2°C on 12th June, 1953 at Jammu and -45°C on 28th December, 1910 at Dras). Srinagar has also recorded as low as -20.0°C (6-2-1895) and as high as 38.3°C (10-7-1946).

Precipitation in the region is both in the form of rain and snow; the two generally occur in different seasons and vary inversely in intensity except in the exceptionally high zones. Western disturbances are more active than the monsoon currents throughout the region, though the latter

are stronger south of the Pir Panjal. The average annual rainfall is about 65 cm with wide spatial variations, ranging from 5 cm in Gilgit to 8 cm in Ladakh, 17.5 cm in Skardu-Deosai, 67.5 cm in Kashmir valley and 115 cm in Jammu region, though Sonmarg is the wettest station (181 cm).

The monsoon generally approaches the region by the 1st week of July and lasts till 15th September. It is more active in the Jammu region. The period on the average accounts for about 40% of the total rainfall of Kashmir region. November is the driest month with less than 1 cm of precipitation.

In winters (December-March) the region is swept over by the western disturbances which are more frequent in the region than in any other part of the country. These are responsible for about 40% of the region's precipitation, with its intensity decreasing eastward. The precipitation in the winter months is higher than that of the monsoon period except in Jammu Region. Relatively high R.H., cloudy skies, fog, mist, and higher incidence of snow are the common characteristics of the winter climate in most of Kashmir. By far the most significant features associated with the westerlies is the snowfall which is partly influenced by altitude as well. It ranges between 20 and 30 cm at Srinagar and 80-90 cm at Sonmarg. It is also heavy on the Pir Panjal ranges, and decreases rapidly eastward.

Considering the overall distribution of climatic elements, four units become obvious: the windward Kashmir (Jammu region), the leeward Kashmir (Ladakh region), the high altitude Kashmir (Himadri, Pir Panjal), and the Kashmir valley.

The continentality in association with height, imparts the Ladakh region a character akin to the cold highland type. Average monthly temperature ranges between -7.9° and 17.8°C with about 5 months experiencing below freezing temperature. Because of thin atmosphere, the radiation and insolation are extremely rapid resulting in extremes of temperature in shade and sunshine, which may cause frost bite and sun-stroke at the same time. The Himalayan ramparts being a meteorological barrier, the monsoonal influence is weak, and out of 11.5 cm of total precipitation more than 40% is received during December to March, the period of general dryness for the country as a whole. Thus, low temperature and low relative humidity impart a keen atmospheric condition to the region.

Contrary to it, Jammu Region reflects a humid subtropical (monsoon type) climate with average monthly temperatures ranging between 13°C (January) and 33°C (June) (Fig.8.5). The proximity to the high altitude restricts the instances of *loo* but helps increase the impact of cold waves accompanying the westerlies. A well-marked

double maxima in rainfall is introduced by the western disturbances (December-February) which account for about 20% of 115.5 cm of annual total. Unlike the former region, the two transitions, i.e., March-May and Oct.-Nov. are well-marked, the latter having fine weather.

The two high altitude zones separating the Ladakh and Jammu regions from the valley of Kashmir or rather sheltering the valley, are endowed with moderate precipitation (more than 75 cm) which spatially decreases westward in this zone though a more abrupt decrease is observed along the northern flanks (Fig.8.5). Temperature often remains low here. Both these elements owe more to the altitude and the location.

Quite conspicuous is the position of Kashmir valley within the sub-humid high altitude zone. As the altitude rises towards the meadowy slopes of the Pir Panjal, known as the *margs*, temperature decreases from 24°C at Srinagar (1,600 m) to 10°C at an elevation of 3,600 m; until the middle of June weather conditions are pleasant. It is then that heat increases and high humidity makes it oppressive till the middle of August. The entire valley wears a haze hiding the surrounding mountains from view. The autumn months with bright clear days are most pleasant. It is till the middle of December that this cool and pleasant weather continues when the first snowfall is hailed with joy as a harbinger of good crop in the year to come.

The year is divided into six seasons of two months each.

Season	Duration
Spring (Sonth)	March 15 to May 15
Summer (Grishm)	May 15 to July 15
Rainy season (Wahrat)	July 15 to Sept. 15
Autumn (Harud)	Sept. 15 to Nov. 15
Winter (Wand)	Nov. 15 to Jan. 15
Severe winter (Sheshur)	Jan. 15 to March 15

Severe winter extends over 70 days, usually from the last week of December to the first week of March, the temperatures are recorded below freezing point. The westerly disturbances are accompanied by heavy snowfall. In 1942, snowfall was measured over one metre, in terms of

rain while Srinagar recorded 68 cm. The annual variable character of precipitation in the valley is noticeable from the following (in cm) :

Districts	1932	1933	1942	1945	1950
Baramula	92.6	133.3	94.0	84.5	135.8
Srinagar	68.5	71.0	77.0	45.0	85.5
Anantnag	58.8	76.0	60.0	35.7	55.8

The rainfall in the valley averages about 65 cm with 19 rainy days. January, February and March are the rainiest months exhibiting greater activity of pre-monsoon and winter disturbances. In this season much snow fall at higher elevations causes floods during summer, making the flowery Kashmir dull. July and/or August is the warmest month with a mean temperature of 23.4°C and a mean daily maximum temperature of 28.5°C. The coldest month is January when temperature falls as low as -1.7°C. Increased cloudiness lasts till the end of February from the middle of December. The clouds reduce the daily maximum temperature while the minimum temperature increases due to less radiational cooling during the night. Largest number of hours of sunshine are found in the month of September.

Of considerable interest in such areas of high altitude and alternating valley-range configuration are the microclimates operating over the terrain-facets and snow fall, their duration and amount. Local air masses descending the mountain slopes and the intensity of solar radiation received affect or rather determine the human habitations, occupations, cropping patterns, etc.

Soils

The formation of soils in Kashmir is the result of climatic factors and geomorphic processes aided by geolithology. The immature soils are encountered as the altitude rises on the mountain slopes where low temperature causes slow weathering and a shorter growing season reduces the scope of physico-chemical and biological processes. Higher up, the soil cover becomes thinner till Alpine pastures appear. Thus, under the prevailing conditions, thick soil covers are confined only to valley bottoms and tertarces, elsewhere only the veneer of calcareous and arenaceous

covers is observed. Most of the areas of crystalline basement have either stony soils or rocky expanses (Fig. 8.6).

Altogether 8 sub-types have been recognised. In the submontane region of Jammu the foothill soils are alluvial in nature, varying from loam to sandy loam. P_2O_5 (phosphate) and K_2O (Potash) contents of the soil are fairly good, but nitrogen content is lesser. In Ladakh region, glacial and mountain meadow soils predominate, supporting but little vegetation.

In the Kashmir valley the soils vary from clay loam to loam. The nitrogen content, in general, is higher than in the other regions and is still more conspicuous in the cultivated lands bordering the forests. P_2O_5 and K_2O contents of the soil are high throughout the valley, as also there is fairly good proportion of Ca and Mg. The valley in its lower level is a repository of alluvium renewed by floods within the flood-zone (Fig. 8.6). In these zones iron and aluminium are also noticeable. Glaciation too played its part in transporting soil as in north-western areas of the valley. According to the productive potential, the soils can be classified into as many as seven types in the valley : *Gurti* (Silt), *Babil* (Loam), *Sekil* (Sandy), *Rad* (Floating gardens), *Surzamin* (Ash), *Karewa* soils and *Nambal* (Peat).

The *Gurti* is rich in clay. When the river Jhelum is in flood this kind of soil settles to the east of the river bank at Verinag, Doru, Achabal, Anantnag, Awantipur, Pampore, Bandipur and Sopore. This silt renews and enriches the solid-bed to the west from Shopyan, Kulgam, Pulwama, Badgam, Sumbal and Baramula. This repeated replenishment is a source of strength to the soil. In these areas of lower belt, which are up to a height of 1,650 m above sea level, there is sufficient accumulation of organic matter and nitrogen. Plant residue through crop stubbles, natural vegetation and animal excretory products, coupled with climatic conditions, are favourable for this accumulation. The optimum mineralization of organic nitrogen occurs during the mid-summer. The long winter does not provide for sufficient nitrogenous materials in early spring.

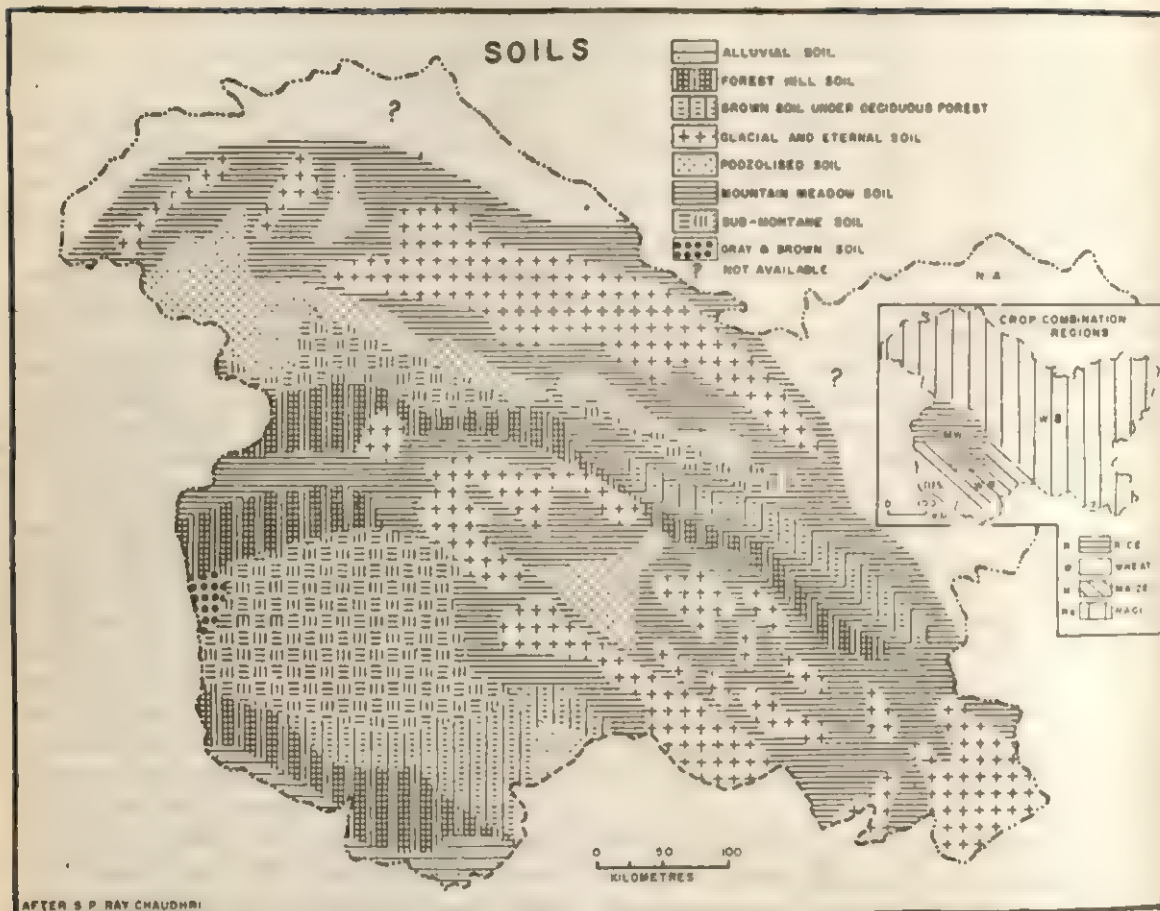


Fig. 8.6

Towards the higher elevations (above 1,800 m) there is need for nitrogenous fertilizers in early spring to give a start to the cultivation of rice and maize. For paddy cultivation, however, water is allowed to cover the fields and remain undisturbed as the specific heat of water is higher than that of the soil. The effect of the sun rays also activates the growth. The P_2O_5 is fairly high. It is only in the *Karewa* soil that the total content is high as against the available content. The *Karewa* soils are generally permeable and as such are poor for cultivation. About half of the valley area is under the *Karewas*.

Bahil is fertile and needs very little manuring. All the important rice growing areas have this kind of soil. The colour is light black when

dry. The extent of this kind of soil begins beyond the flood zone.

Natural Vegetation

Lithology, slope, altitude and climate combine together to produce variety of vegetal covers. The vegetation varies from the Himalayan meadows in rocky and often snow-covered Ladakh and high altitudes above snow line to the evergreen conifers on the gentler slopes of the ranges as also from scrub jungle of the foot-hills to the deciduous forests of the lower southern slopes of the Pir Panjal. Out of the total area of 3,200 km² of the forested tract in the region, Ladakh has only about 5 km² while the Kashmir valley is the most thickly forested region where the districts of Barmula and Anantnag have respec-

tively 71 and 60% of their areas under forests. The valley (Kashmir province), as a whole shows 58.4% of its area under forest while Jammu province, about 46%, varying spatially from 23% (Kathua) to 53% (Udhampur), closely followed by Doda (50%), Jammu (44%) and Poonch (42%). Species have strong regional association with punctuation by the altitudinal zones though in general conifers account for about 85% of the forest area.

On rainier southern slopes of the Pir Panjal, vegetation cover is thinner while the northern slopes are covered by thick coniferous forests. Sparse and dry scrubs mark the vegetal cover of the Siwalik zone. Except the few patches of Himalayan meadows, Ladakh is almost devoid of vegetal cover. Stunted cedars and willows are found on moister strips.

In the Kashmir valley, the well-marked vegetation is willow which covers the marshy areas only. Fir has its best growth somewhat higher up in the valley. The commercial fir forests cover 2,942 km². Other species of conifers—*Deodar* and *Kail* occupy high slopes and have more denser cover.

In the rest of the region the natural vegetation is of mixed type and is unclassified, termed as mountain-vegetation.

Though rich in forest, but due to inaccessible terrain, the region permits only 40% of its demarcated forests for commercial exploitation, which contributes about 17% of the Regions revenue (excl. Pak. occupied Kashmir). The forests of Kashmir region have been under scientific management since 1913, and at present 90% of the demarcated forests are under working plan.

Minerals

The mineral resources of the region are limited and less known as the mineral-bearing horizons are highly disturbed and discontinuous due to intense folding and faulting. Coal is known to occur only in Jammu province in a belt extending from Jangalgali to Kalakot (about 50 km). It is mostly semi-bituminous to semi-anthracite. The main coal-fields, with estimated reserves of 161 million tonnes,⁴ are Jangalgali, Chinkali, Chakar, Mahogala and Kalakot (Fig 8.7).

The coal mining is a State undertaking and there are only two coal mines in operation both located in Kalakot fields where 133 persons are employed (1961). The target of production for the Fourth Plan is at 70,000 tonnes per year. A major portion of the coal mined in the region is used to generate electric power.

In the Kashmir province lignite occurs in the tertiary formations of the valley at Nichahom-Chowkibal, Odur, Raithan-Lanyalaf, Tanmarg, Baramula, Bundwara etc. The estimated total reserves of the region is 84 million tons. The reserves at Nichahom and Chowkibal have been worked up to a depth of 40 m but the quality extracted so far is poor with 25 to 50 per cent ash and 25 to 30 per cent moisture. The calorific value varies from 4,500 to 5,500 B. T. U./lb on an air-dried basis. Though not of much promise, peat is mined from the low-lying areas along the Jhelum below Srinagar.

Limestone has been used for building purposes since ancient times; mention may be made of the Martand temple near Anantnag. It occurs practically all over the region, but there are only two important quarries, Khunmuh-Khrew in Kashmir province and Basoli in Jammu province. Other important occurrences are at Mansabal, Anantnag, Achabal, Verinag and Bandipur in Kashmir Province; Kalakot and Balawan in Jammu and Khalatse and Sarpul in Ladakh region. Gypsum occurs in Baramula, Doda and Udhampur districts.

There are many mineral and sulphur springs in the region. The main sulphur springs are near Anantnag, Sadarkot, Wuyan and in Pugga Valley (Ladakh). The estimated deposits of sulphur are 200,000 tonnes. Borax is also found in the Pugga Valley from hot springs, with an annual production of 1,000 tonnes. Bauxite occurs around Riasi and Poonch with estimated reserves of 13 million tonnes. Copper ores are known to occur at Lashtiyal, Shumabal, Ashmukam and Zaskar. Zinc occurs in Riasi, lead and silver in Sersandhu, Kistwar and Buniyar.

Iron ores, in form of ferruginous cherts with local enrichments of haematite, occur at Khandli

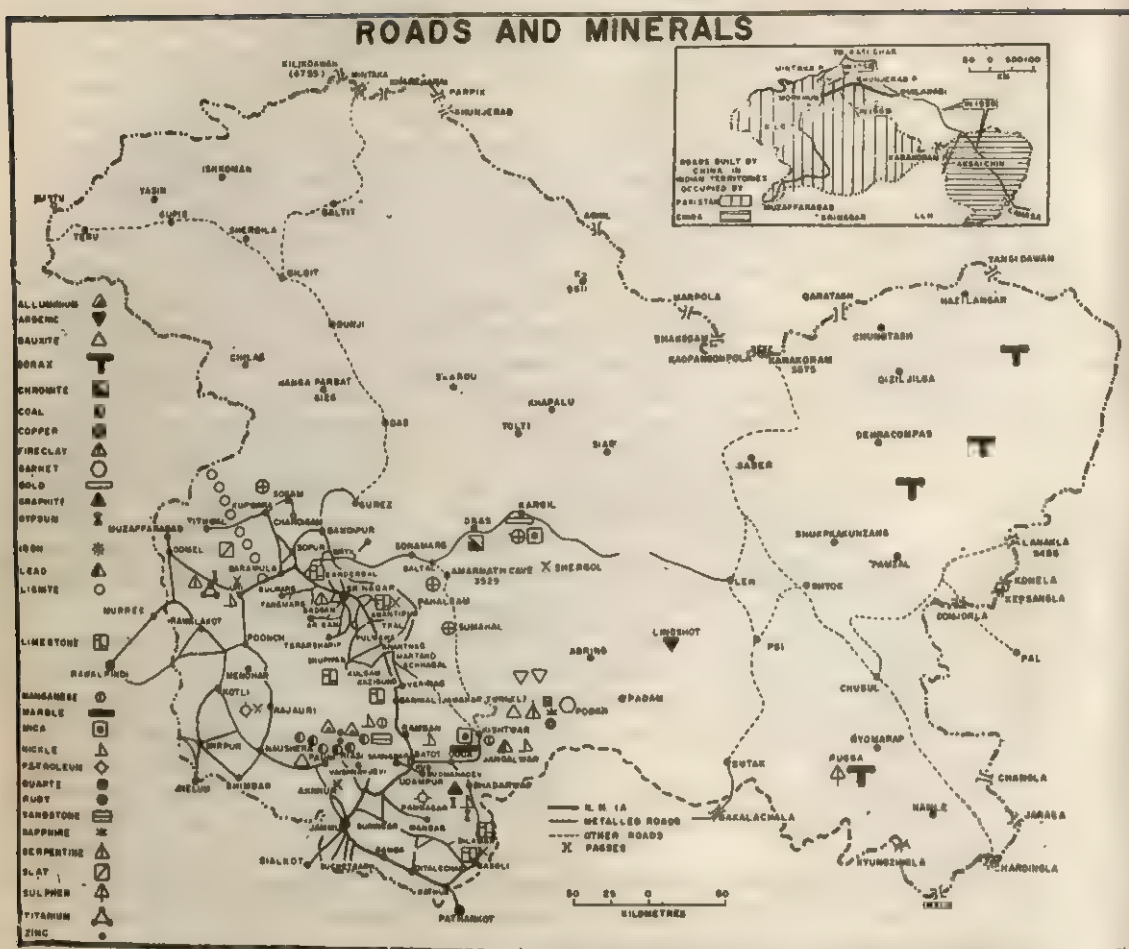


Fig. 8.7

and Matab in Jammu province and at Ouni and Khrew in Kashmir province. In the iron ores the percentage of iron is too low (14-24%) for commercial exploitation.

Alluvial gold is known to occur in the terraces of the Indus. The region is also known for its semi-precious stones, e. g. garnet, ruby sapphire, etc. (Fig. 8.7).

In 1960, the value of the total mineral production was estimated at about Rs.15.50 lakhs.⁵

Oil and natural gas is expected to occur in the tertiary deposits of Jammu province at Naushera, Dharamthal and Ramnagar.

The Cultural Setting

Population

The Kashmir region is the home of various races of people. In the hilly tract south of the Pir Panjal up to the Punjab Plain Dogras are dominant, speaking Dogri, a form of Pahari Hindi. Dogras are divided into several sub-groups, including the Muslim converts. Next to the Dogras are the semi-nomadic Gujjars and Gaddis, concentrated mainly in Poonch, Udhampur and Muzaffarabad. They are said to be Rajput migrants from the Plain. Their language Gujjari resembles Rajasthani.

The people of Kashmir Valley are quite different from the rest of the Kashmir region. According to the legend, the Valley was earlier occupied by tribal people called, *Pishachas* and *Yakshas*. Since Kashyap's time, the Brahmins, popularly called Kashmiri Pandits, form a distinct group, "Considered to be the purest specimen of the ancient Aryan settlers in the Valley".⁶ The Kashmiri Pandits are subdivided into 133 exogamous *gotras*, each member of which claims to be a descendant of the *Rishi* (sage) whose name the *gotra* bears".⁷ The Saraswat Kashmiri Pandits, though small in number, are highly advanced in education. 70% of them are

literate, enjoying high position in the society and government services.

The conversion of Kashmiris to Islam during the 13th and 14th centuries changed their social structure, and to-day majority of the people in the Valley are Muslims divided into two main sects; i.e., the Sunnis and Shias, former being in majority.

The Hanjis, Muslim converts from Kshatriyas etc. are mostly boatmen by profession. They live in boat houses and are well-versed in *Sikara* rowing. They are mentioned in *Rajatarangni* as *Nishadas*. The Skardu-Deosai region is inhabited by an Aryan race called the *Dard*. Before

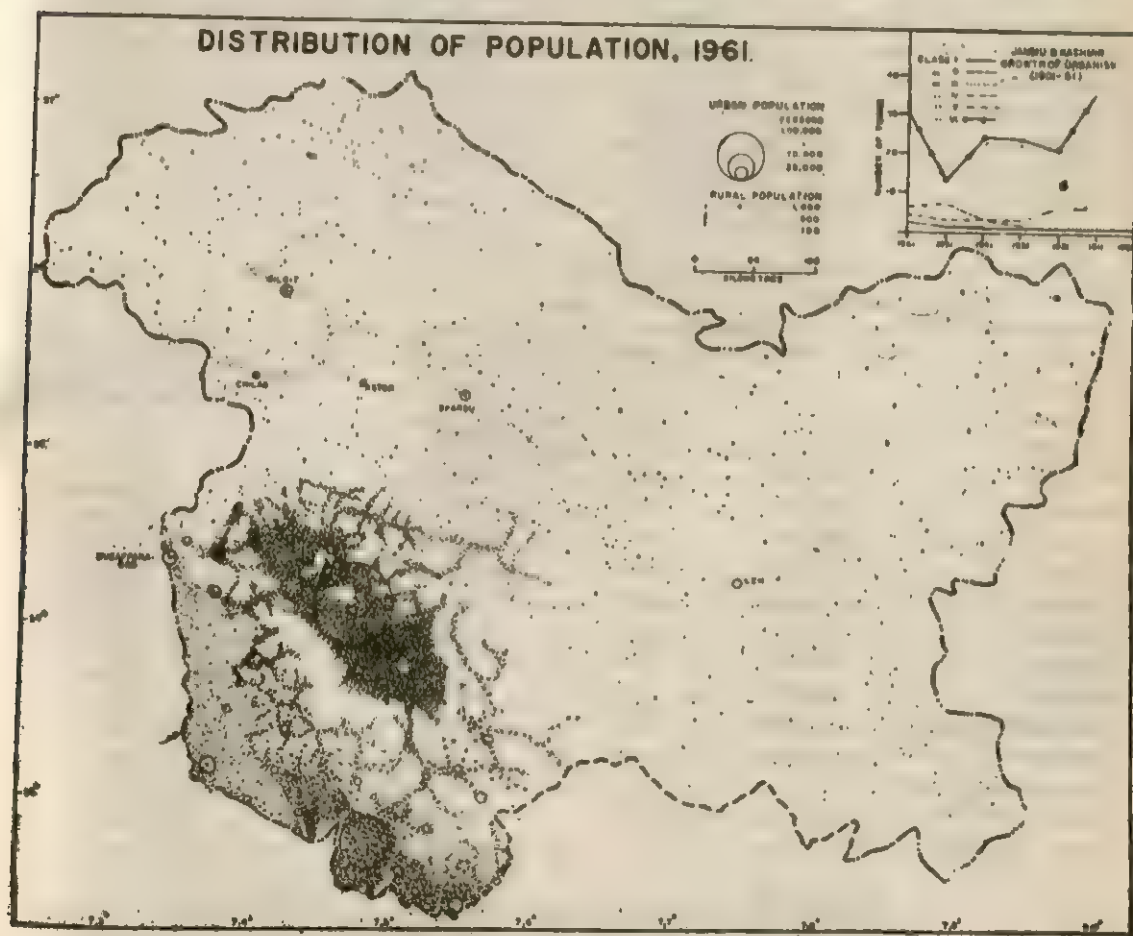


Fig. 8.8

conversion to Islam, the Dards were Buddhists. There are still some villages in the region which follow Buddhism.

The Gilgit-Baltistan region is mostly inhabited by *Baltis* who are a mixture of the Dards and the Ladakhis. In this region the majority of the people are of Shia faith and the rest are Buddhists.

The people of the Ladakh region are known as the Ladakhis. They are derived from the ancient *Bhuttas*. They are sturdy hill people and are able to negotiate with the high mountains. They are mostly Buddhists. "They have four sub-castes, i.e., *Gyalpo* or Raja; *Jirak* or officials; *Mungrik* or cultivators, and *Ringan* or menials."⁸ The Ladakhi village has a *gompa*, who owns most of the cultivable land of the village. The villagers are the tenants of the *gompa*. Every *gompa* also maintains a number of monks and nuns dedicated for life to its service. Ladakhis eat meat and drink a country liquor called *chhang*.

The population of the Kashmir region is about 4.4 million (1961), including 0.9 million in the area beyond the Cease-Fire Line, about which no

detailed information is available. The region as a whole is least populated amongst the regions of India, mainly because over 90% of its area is mountainous and 95% of it is unsuitable for cultivation. Even this population is unevenly distributed (Fig. 8.8); over two-fifths of the total population is concentrated in the vale of Kashmir in less than 7% of the area. In fact, 66% of the population of Jammu and Kashmir State is concentrated in four districts—Anantnag, Srinagar, Baramula and Jammu, covering 13% of the State's area. The district of Ladakh constitutes 44% of the area of the region with only 2.0% of its population. The over-all density of the region is the lowest (20 per km²) in the country excepting the Eastern Himalaya (14). There is wide sub-regional disparity; while the Ladakh has as low as less than one per km², the vale of Kashmir exhibits over 125. At district level, Srinagar has the highest density (205) in the region, followed by Jammu (160) and Anantnag (121). The area beyond the Cease-Fire Line carries a density of 10 per km² (Table 1).

TABLE 1^a
(1961)

Districts	Population	Persons/km ²	Area in km ²	% of area to total area	% of population to total population
Anantnag	654,368	120.5	5,430.9	2.43	14.8
Srinagar	640,411	205.2	3,121.2	1.40	14.5
Baramula	604,659	92.1	6,568.2	2.94	13.7
Kashmir Province	1,899,043	125.6	15,120.3	6.80	43.1
Doda	268,403	23.7	11,344.7	5.09	6.1
Udhampur	254,061	56.6	4,484.9	2.01	5.7
Jammu	516,932	159.9	3,233.8	1.45	11.7
Kathua	207,430	78.2	2,651.2	1.18	4.7
Poonch	326,061	74.5	4,374.8	1.96	7.4
Jammu Province	1,572,887	60.2	26,089.0	11.7	35.7
Ladakh	88,651	0.9	97,782.4	43.9	2.0
Pakistan occupied Kashmir	0.9 million	10	83,808	37.6	19.2
China occupied Kashmir (in Ladakh)	Negligible	...	41,500	18.6	..
Total	4.4 million	20	222,800	100	100

Over the period of 60 years (1901-61) the population of the State increased at a decennial rate of 11% on an average. The growth, no doubt, has been slow but steady. Even in the period of general decline (1911-21) this region recorded an increase of about 5% while the decade (1951-61) of spectacular growth throughout the country (21.50%) marked only 9.1% increase. This slow growth rate is the cumulative effect of economic backwardness, natural calamities, absence of adequate medical facilities and political instability prevailing in the region from time to time. During the decade 1901-11, cholera broke out thrice and took a heavy toll of life (17,118). During 1911-21 as many as 18,000 recruits from the State were killed in the World War I. In 1920 the mortality rate was fairly high due to influenza, plague and cholera; influenza alone accounted for 44,514 deaths while plague and cholera took 9,134 and 18,064 lives respectively. In addition, small pox accounted for a death toll of 16,504. During the decade 1921-31, severe famine followed by cholera (1925) and plague (1928) and exceptionally heavy rainfall in the valley (1927-28) were the main elements in lowering the population growth rate. The decade 1931-41 was also not free from natural calamities. During 1941-51 the State suffered a lot as a result of the Pakistani aggression (1947).

Over and above, the cold climate and the mountainous terrain seldom act as attractive forces for new habitation as the environment necessitates the provision of more fuel, warm clothing etc., and thus raises the cost of living. Limited resources restrict the employment opportunities as well. Hill and valleyward movement (transhumance) becomes the mode of living for many a people. Restriction on acquisition of land and property by the non-Kashmiris also has been responsible for slow growth rate. For its full integration with other parts of India this restriction need not be continued.

The over-all growth of 66% (1901-61) varies spatially from 34.5% (Kathua) to 104.2% (Srinagar) corresponding with the intensity of population concentration. Other districts showing growth more than the State average are Baramula

(84%), Doda (77%), and Anantnag (69.4%). It may, thus, be inferred that only the valley and Doda district depict a growth exceeding the State average. Udhampur and Jammu districts recorded population growths up to 56% and 51% respectively during the period.

The analysis of decennial growth by districts shows that Kathua and Jammu have shown negative growth during 1901-1911. The decades of the century appear to have recorded maximum increase almost all over the region.

There has been spectacular increase in urban population (274%) during 1901-61 while the rural population during the same period recorded only about 50% rise.

The period 1941-61 appears as the span of greater urban growth primarily due to immigration towards the urban areas from within and outside the State. This by no means reflects any serious growth of urban activity as only 4.4 lakhs of people have been added to the urban total over a period of sixty years (Fig 8.8 Inset).

The urban population in 1961 was 16.7% of the total population of the State; of the total urban population (0.59 million), about 65% is concentrated in the two cities of Srinagar (2.85 lakhs) and Jammu (1.03 lakhs). Of the 43 towns in the State, as many as 30 have below 5,000 population and are rural service centres with some urban functions. Even Srinagar and Jammu have become large because of administrative and trading functions rather than industrial activity.

The Pakistani aggression of 1947 led to temporary displacement of population in some of the areas, such as Poonch and Mirpur which were later reoccupied. In the 1961 census 68,291 immigrants were enumerated in the region out of which two-thirds were from W. Pakistan. Jammu is the principal district to have absorbed a large number of displaced persons.

Literacy : As far as literacy in the rural areas is concerned, only 15.1% of the male population above the age of 5 years is literate. In urban areas this percentage is 42.4 which raises the overall literacy percentage of males in the State to 19.7. Even out of 15.1% literate male popu-

lation, about 2/3rds do not possess any educational certificate at all. The overall average of literate female (3 per 1000) is extremely low.

The district of Srinagar shows a percentage of 23.7 in its literacy with 8.52 for females. In Anantnag male literacy is 15.7% and female literacy is 1.71%, while in Baramula the proportion is 15.3% and 1.86% respectively. The Sonawari tahsil has a very low percentage of male literacy (1.06).

Rural Settlements : Rural occupancy units (6,559) are mostly small in size (70% villages with less than 500 inhabitants) in the region. This is also evident from the average population size of the villages (453). For 70% of units this average is only 219 while the medium-size (500-1,999) group has an average of about 700. Medium-size villages account only for 28% in number but accommodate highest proportion of rural population (55%). Of the total units, 54% are located in the Jammu Region where about 73% of the units are of small size (including 40% of very small size i.e. <200). Isolated homesteads which are widely distant apart in Ladakh are built on small flat projections of ranges taking into consideration drinking water, cultivable land and pastures.

In the valley, villages are mostly compact in nature with close-knit houses. The alignments of villages in the region are largely determined by the physical elements as well as the transport facilities. The number of villages with a population of 2,000 and over is limited (119) where only 11% of total rural population lives. There are 2,275 villages with less than 200 population where only 8% of the total rural population resides.

Due to the rugged topography over most of the region, the villages occupy large areas but

have small population. The agricultural as well as built up areas are scattered over long distances interspersed by rocky stretches. The proportion of rural population in the lowest size class has progressively changed during the last four decades (1921-61), both in the State and its constituent districts. It shows that new rural settlements have not been established as is evident from the decreasing proportion of population in small size villages (Table 2).

Anantnag, said to be the granary of the State because of its highly fertile soil and its beautiful landscapes, has concentration of larger villages (25) next to Baramula (33).

The villages comprise of a number of homesteads surrounded by open spaces and pastures, and except in the vale of Kashmir, these are generally confined to the sub-valley basins. The smaller villages are generally nucleated while the larger ones are usually dispersed. The houses of patrilineal kins are generally clustered together around common yards and every cluster forms a distinct group in the village. However, in the valley of Kashmir, since time immemorial, springs have attracted settlement almost everywhere as at Uma, Brariangan, Tulamula, etc. At the head of a picturesque valley and nestling in the middle of mountain ranges, these villages form patchy settlements. Examples of such spring villages are Tulamula, Nilnag, Vicharnag, etc. On the elevations, villages have centered round shrines where the source of irrigation is also available for agricultural purposes. Other attractive sites for settlements have been the foot of hills or the opening of valleys below the mountains in the interior. In such an environment, with highly scattered population, service settlements have grown on route junctions. Notable

TABLE 2

Population per 1000 rural population in villages by size class of population (1921-61).

Decade	2,000-4,999	1,000-1,999	500-999	Under 500
1961	100	240	310	339
1941	70	211	295	412
1931	60	195	295	447
1921	44	167	303	480

amongst these are Harwan, Ganderbal, Magam, Nagam, Tanmarg, Verinag, Kukarnag, Mattan, Pahalgam and Achabal.

In the Jammu-Mirpur region most of the villages are inhabited by Brahmins, and in the Kashmir Valley region by Muslims. Generally the Pandits of Kashmir region are the land owners and not cultivators. They have suffered on account of the imposition of land ceilings from time to time which is now 10 hectares per family; the alternative job opportunities are, however, few and restricted.

There are two distinct types of settlements based on the occupation of the people. The one is that of the graziers who tend sheep and goats moving in the higher slopes of the Alpine glades for grass and water. These graziers are pseudo-nomadic with their seasonal mobility towards the upper stages of the tributary valleys through narrow gorges. Beyond Avantipur opens out the Valley of Tral. It has beautiful grassy slopes in which the typical top village of Sootoor is

situated at its head. The steep ascent of 550 m zigzag up the grassy slopes on one side and down on the other for 600 m. The tributary valleys have also their mountain routes connecting the interior. There are mountain paths from this valley to the Liddar Valley. The ridge is crossed at 4,433 m to the Nagberan vale which is about 8 km wide. The ascent begins from the Liddar-wat. The two well-known tributary valleys, the Liddar and the Sind, have also high mountain passes used by the graziers in summer. Many small lakes with sufficient water in summer when snow melts also serve as centres of attraction for the graziers as at Tar Sar, Yam Sar and Khem Sar. The *gujjars* have huts (*Dokas*) on these elevations generally built on the margin of a spur well covered with grass and clay. It has no backside; only the front is visible. It serves both as a stable and a dwelling.

The other type of rural settlement which needs mention is that of the *Hanjis*, as the boatmen of Kashmir are called. Superior to *Sudras*, these

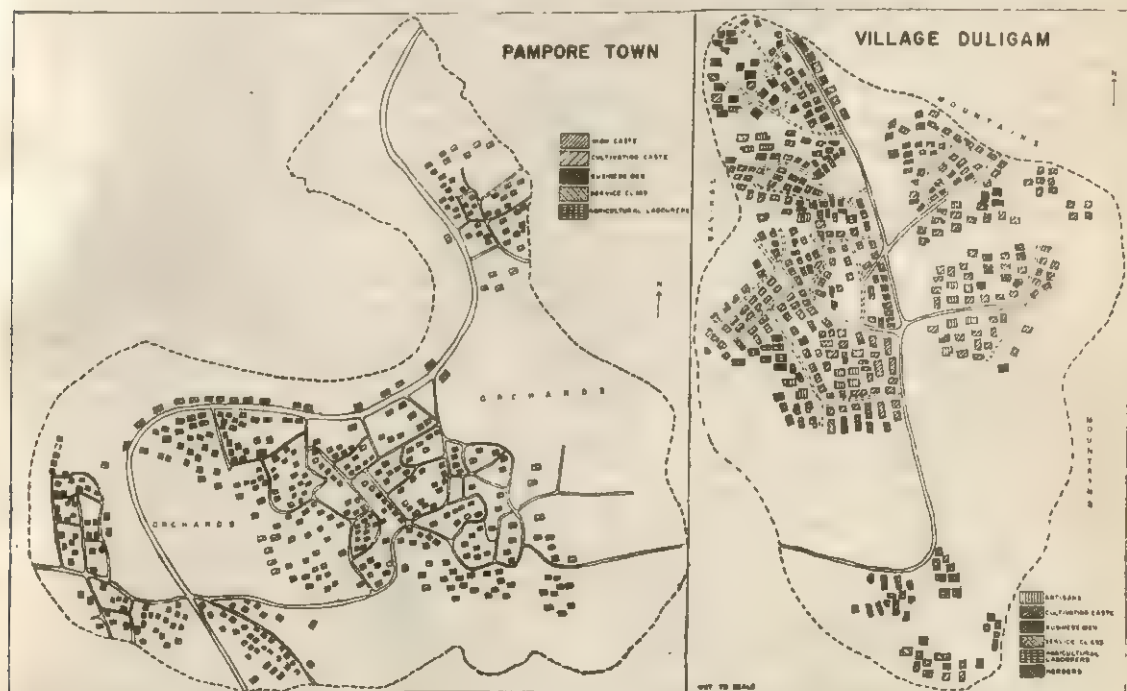


Fig. 8.9

include half amphibious peddlers of the Dal Lake who are engaged in vegetable gardening, fishing and collecting *singhara* nuts.

Opening of roads and use of electricity may be taken as two main factors responsible for breaking the conservative character of a village which is now open to urban influence. A new sense of awareness has dawned with free education, film and the radio, creating an urge for production which brings about change in outlook and the standard of living. A visit to an experimental farm in any rural area will show how the *Panchayats* are functioning in local environment. Whether in an alluvial village, or a swamp-hamlet or the scattered settlement on the *Karewas*, the transistor, the radio climbs even the highest elevation keeping the Alpine graziers posted with up-to-date information.

Sample Villages : Duligam (Altitude 2,500 m; population—2,314) is a village in tahsil Ramban (Doda), about 3 km south-east of Banihal. It is a Muslim-majority village, situated in a narrow valley between two ranges. The village has grown along a kachcha road connecting it with the N.H.1A. It is a multi-hamlet village. The main cluster lies to the west of the road. Roads from the hamlets converge here. Every hamlet has its own religious shrine. Except the southernmost hamlet, where cobblers are mixed with cultivators, all other hamlets consists of (apart from cultivators) carpenters, blacksmiths, milkmen, shepherds, barbers, etc. with some sort of clustering together (Fig. 8.9). The main crop of the village is maize.

Village Haihama (Handwara tahsil, Baramulla) is situated 53 km north of Sopore town. It is

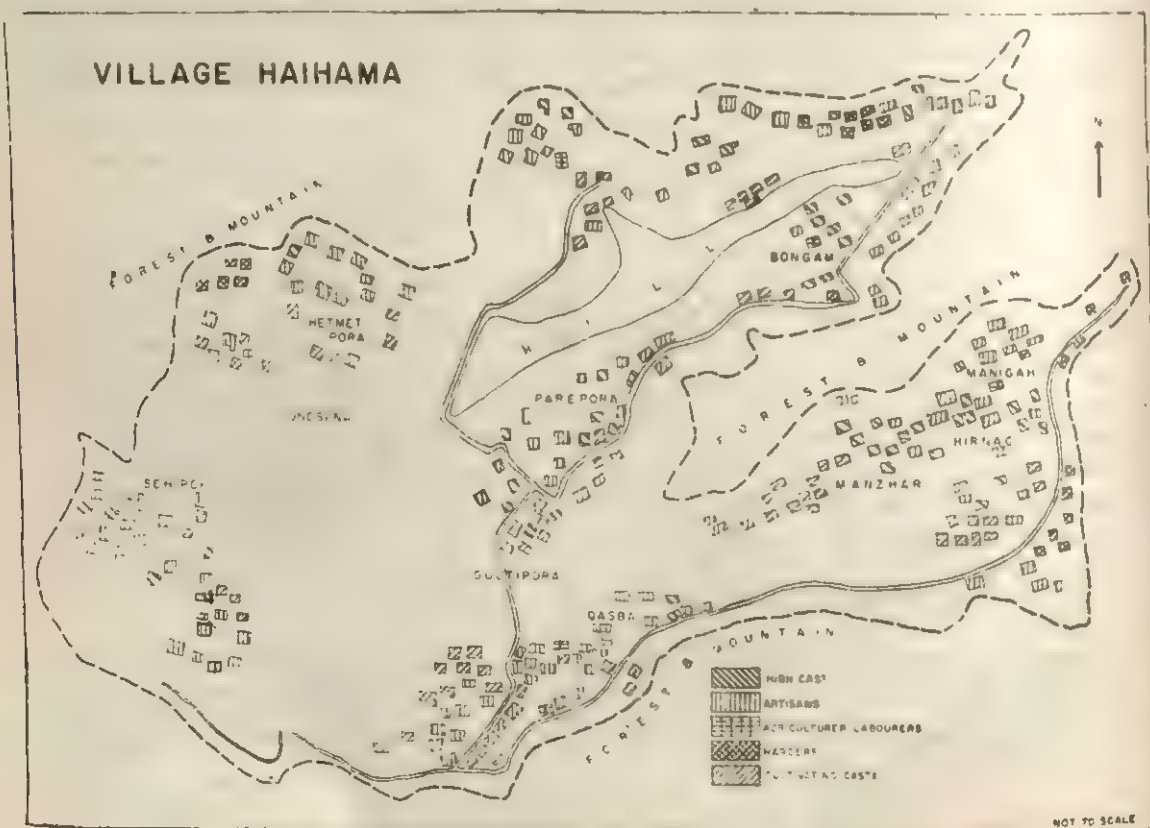


Fig. 8.10

surrounded by forests and mountains which also protrude in the built-up area, dividing it into several hamlets (Fig. 8.10). Small streams further intersperse the built-up areas which occupy the slopes and encircle the cultivated area. It is largely a Muslim village. The dwellings of Gujjars are clustered in the N.E. and N.W. corner of the village, nearer the forest where grazing facilities are available. *Peers* and weavers are scattered throughout. Blacksmiths are confined to Qasba and tailors to Salkot. Cultivators are mainly in Sehipora, Helmetpora and Salkot occupying the fringes. Their fields are located in between so that the melt waters may drain through them. Businessmen are few. Every hamlet has its own religious shrine. The main crop is rice.

Maraliya is a Brahmin village, 14 km south of Jammu (Tahsil Ranbir Singhpora, Jammu). In 1822 Maharaja Gulab Singh awarded 450 acres of jungle to his Colonel, Mohar Singh who built the first house, the nucleus of the village. The entire villagers are the descendents of his family.

All the houses are single storeyed except one and are characterised by flat-topped roofs covered with about 50 cm thick coating of wood, mud and cow dung. There are 98 houses of which 23 are pucca, 20 mixed (pucca and kachcha) and 55 are kachcha. The chief building materials for the kachcha houses are wooden planks, mud and *Sarkanda*; only three houses of the village have lintered roofs.

All the houses are grouped at one place, and the cultivating fields and orchards surround them. There is only one pucca lane, others being narrow and kachcha. Some of the lands in the outer margin of the village was sold where Krishna Nagar Basti is established as a hamlet, and some of the land has been acquired by government under a new legislation (*Khatma Chakdari Kanoon*) to rehabilitate Brahman Sikhs from Poonch at Singhpora Basti. There is one *Gurudwara* also in this locality while the main village has a Durga temple. The village has only one well and 7 hand pumps. There is one Primary School, and about 2 km north is Miran Saheb, the nearest marketing centre with a High School for girls and a Middle School for boys.

Unlike the valley, where Brahmins do not cultivate their own lands, the main occupation of the village is agriculture. Mostly the peasants have their own plough. There are two tractors in the village which are used on hire by other cultivators also. Although the Ranbir canal distributary runs nearby, the village does not derive any benefit due to its lower level. The village has, however, a pumping set and a tube well for irrigation owned privately. Wheat is the main crop, but rice and horticulture are also important. There is one big pond for the use of cattle. There is one rice mill and one flour mill. The village promises to be a good rural central place.

Telbal, about 13 km north of Srinagar beyond Shalimar Gardens, is a medium-size (area 741 acres; pop. 1,377) Muslim village with preponderance of rice cultivation and apple orchards. The nucleus of the village, Dangarpur (a large hamlet) has grown on a relatively higher level away from the Harwan nala, and close to it are the apple orchards; Yungon along with four smaller hamlets surrounding a well lies close to the nala. There are about half a dozen smaller groups of habitations either on the bank of the nala or close to it. Thus the village population is hamleted, most of them bearing their own names based on community group leaders. The nala water is ingeniously used for irrigation purposes. Floods are common, which are otherwise useful for rice fields. The village looks to Srinagar for various services (Fig. 8.11).

Urban Settlements : Out of 43 urban centres of the region all, except Srinagar and Jammu, came into existence only after 1901. Since then, the number of towns has been fluctuating from 45 (1911) to 25 (1951) under different factors including the changes in the classification indicators of the Census. Spatially there is some sort of concentration of the towns, one around Jammu (21) and the other in the valley (15). The rest are scattered on the western margin of the region, while Leh is the only town in the west Ladakh region. Prior to their upgrading as towns, most of these centres emerged as rural market centres along the cart roads or at the

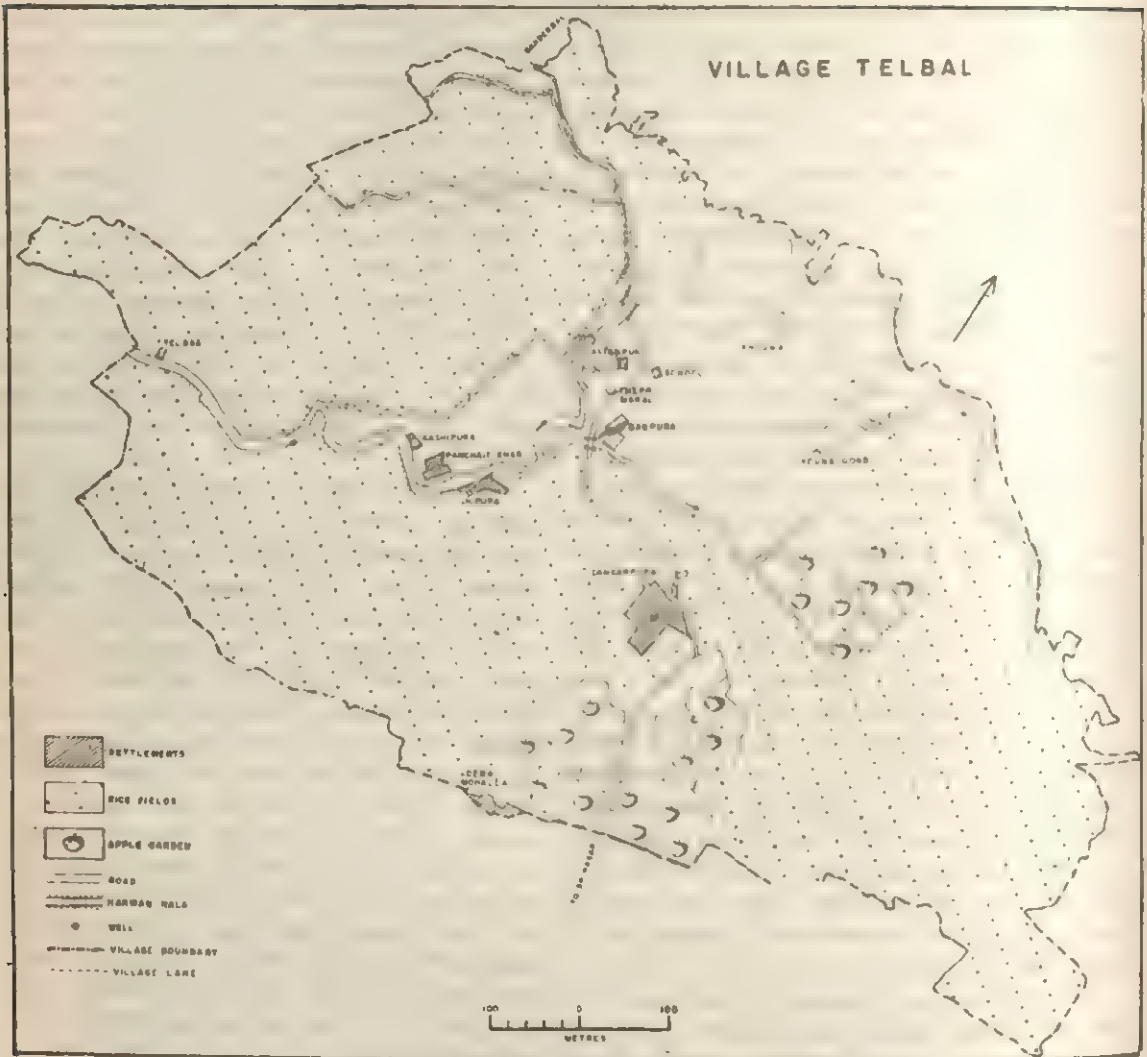


Fig. 8.11

route junctions, particularly in the valleys often distant apart from each other. Leh, Skardu, Kistwar etc., are amongst such centres. Srinagar had its origin during the Mauryan period and has since retained its supremacy as a regional and capital centre, while Jammu emerged purely as an administrative centre in the 11th century. Later, with the increased intercourse between the plains and mountains, resort centres like Gulmarg, Pahalgam etc., developed, while other strategic and smaller administrative centres have also

grown during the last few decades. Some of the centres which used to serve as the outpost have lost their former importance due to the emergence of new strategic positions and changes in routes; Uri, Baramulla, Mirpur etc., are such examples. The growing importance of the Pathankot-Jammu-Srinagar-Leh National Highway (N.H.1A) has adversely affected the urban activity elsewhere and provided stimulus to the existing centres along it as for new sites for others. Jammu and Udhampur, for example,

have gained much while Banihal, Pampore, etc., have also emerged as promising centres.

The hierarchical significance of Srinagar (295,084) and Jammu (102,738), in their respective regions, is well marked as they leave far behind their next ranking towns of Anantnag (21,087), Baramula (19,854), Sopore (18,987) in the former and Udampur (10,263), Poonch (10,196) etc., in the latter. The two cities, separated by Pir Panjal ranges, are situated 292 km apart on the National Highway. The two respectively are the summer and winter capitals of the State, and being the centre of administration they have attracted educational institutions including universities, trading and various other social and cultural institutions. Apart from these two large cities, only Anantnag has attracted some new industries and has developed to some extent. Among the new towns is Banihal lying on the southern entrance of the Jawahar Tunnel which was necessitated by the need of year-round traffic to the valley. Its impact is traceable in the almost stagnant position of Ramban. Doda could achieve the town status only due to the administrative adjustment and establishment of district headquarters there. The impact of transport link is again prominent in raising the status of Kulgam village. Others like Arina, Bandipur, Hajin, Lakhanpur, Nowshera etc., are the upgraded villages having mining, border out-post, or power stations etc., as their main services.

There is no class II town at present in the Region. Anantnag is the single representative of group III. It is centrally located by the side of the National Highway. This town also functions as a distributing centre for consumer goods to the other adjoining urban and rural areas. There are only 4 towns of class IV group, i.e., Baramula, Sopore, Udampur and Poonch. There are 6 towns in class V and 30 towns in class VI. The town of Shopian located in the S.W. of the valley, was the gateway of the old Moghul route connecting Rajouri with Kashmir. It is an important centre of fruit trade like apples, walnuts, cherries etc. The town of Udampur is situated in the south of Pir Panjal in a small

valley on the National Highway. Class VI towns occupy about 70% urban area with only 14% of the total urban population of the State. Leh, the only town in Ladakh district, has recently been connected with Srinagar by the National Highway. Its link to Lahul and Kulu valley will further invigorate the urban activity.

*Srinagar*¹⁰: (34° 5' N—75° 52' E; 1961 population 285,257), situated in the vale of Kashmir, the core of the Kashmir region, on the Jhelum and the Dal lake, is by far the largest city of Kashmir Region and the State Capital with its famous tourist attractions, Moghul gardens and scenic glammers of land and water. By virtue of its central location in the valley with advantageous convergence of routeways in various directions within the valley and outside, Srinagar has throughout its long history functioned and prospered as the regional focal centre. The Central Asian route debouched on to it through the Sindhu valley, only one stage from the city, while the Jhelum was also an important transport artery. The National Highway and various other roads radiating in all directions have revolutionized the regional transportation (Fig. 8.12).

The site of Srinagar, though not so meticulous, is yet the best that could be availed of in the region with embankments on the bank of the Dal lake in the very beginning; the lakes not only add to the scenic grandeur but also serve as water repositories with sufficient land for expansion and cultivation. The two hills, Sankaracharya hill and Hariparbat, guard the city as sentinels and have been important watch and defence points; Hariparbat has been a fortified point. Jhelum has been spanned through eight bridges to link its old and new sections. A network of canals and streams also connect its various parts which are easily navigable.

As mentioned earlier, Srinagar has been, since its inception, the principal city of Kashmir whose history 'has always been reflected as it were in that of its capital which has not changed its site for more than 13 centuries'. Huen Tsang found the city at the present site itself, about 3 km away from the old capital at Pandrethan,

then known as Purandhistan or Srinagri (the city of Lakshmi) founded by Ashoka the Great. Srinagar was founded by King Pravarasen II in 6th century with village Saritaka as the nucleus, the place of goddess Sarika, and was earlier known as Pravaraपुरा, an abridged name for Pravarasenपुरा. Hariparbat hill is the place of worship of goddess Sarika. Although several new capitals were built by different kings at different sites, none could maintain itself and all of them either disappeared from the scene or are functioning as dwarf centres of local importance. Parihasapura, founded by king Lalitaditya (A.D. 750) is now the small Paraspur, 3 km south of Shadipur on the *Karewa*; Awantipur of King Awantivarman is again a village, 29 km south of Srinagar, while his son's capital city of Shankarpura, 8 km west of Parihasapura, is now the village Pattan. Other capitals like Kanishkapetra (now Kainspur), 8 km NE of Baramula, has now no remains traceable, and such has been also the fate of Hushkapura (modern Hushkar) and that of King Jushkas' capital, now village Zukur.

The city has eight wards including 392 *mohallas*. It has relatively expanded faster during the last two decades and has added about 13 km² to its urban area by absorbing Theed, Chasmahahi, Dar-Bag, Zeethyar, Nowpora, Gupkar, Hasthil and Karapora (Abi), places mostly inhabited by visitors and tourists. Several new residential colonies have been added with modern amenities, and innovations have been made in the old congested areas also, yet the city has a number of localities which suffer from appalling congestion and lack of utility services. The city is changing fast its famous carved wood architecture to modern building materials. Fire has been less dangerous, though the flood remains an usual problem; these, along with the epidemics have often devastated the city earlier. About half the households live in dwellings with 3 rooms or less. Majority of the buildings are built up of burnt bricks, and about 41% dwellings are covered by shingle as against about 1/3rd with roofs of corrugated iron sheets. In the ward no. 8, inhabited by poorest section of

population, over one-third of the dwellings have walls of unburnt bricks and mud, and 28% of timber, while 42% are thatch-roofed and over 40% have shingled roofs. As compared to 1941 (48,925 per km²), the city has now slightly lesser density (45,177 per km²), as the new colonies are built with a view to modern planning and sanitation.

The population of the city has increased by about 150% during 1901-61. The city has a wide disparity in its sex ratio (865); being administrative, commercial and industrial city, it attracts a large number of males from outside who do not bring their families for various reasons. Apart from its very important sericulture industry, the city is world famous for its handicraft industries such as shawl-making, though lesser so in wood-carving, embroidery, leather works, carpets etc., which provide employment to various age-groups, and yet the city gives work only to 28% of its population; only 3% of the females are workers. Other services provide the maximum jobs (43%), while manufacturing other than household industry is the second most important (20%) job-providing channel. Household industry (12%), trades (11%) and transport and communications (7%) are other important occupations. An industrial Estate has been provided for industrial development; a large size joinery mill was installed near the city to prepare slippers from logs which used to be floated through the Jhelum to Pakistan. True to the nature of the capital city with vast transport facilities, the city is the largest educational and service centre; it has a university with regional Engineering and Medical Colleges.

Though haphazardly grown, some functional areas are distinct. The Lal Chawk (the Red Square) is the main business centre of the city with two distinct roads running east-west, the Hotel Road and the Residency Road. In addition to vigorous business activity, it contains a number of hotels, hospitals, educational institutions, parks, Polo-ground and golf-course etc. (Fig. 8.12).

The city of Jammu (32°44'N—74°55'E) is a typical foot-hill urban centre located to the south of the Pir Panjal. It commands strategic im-

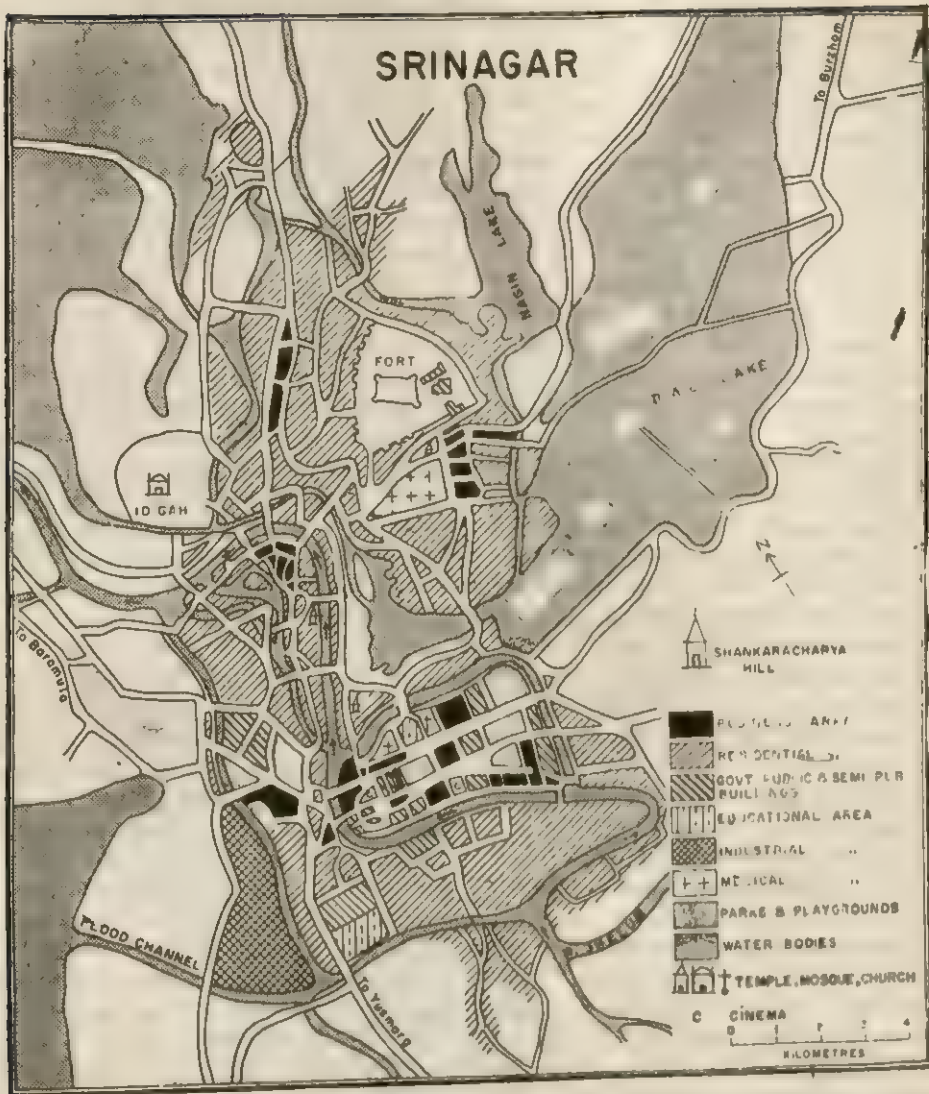


Fig. 8.12

portance as the national highway leading to the valley of Kashmir and beyond passes through this city. It was the centre of Jammu Rajputs and Jambu Lochan, a scion of the Solar dynasty of Ayodhya founded the city.

The old city (as it existed before 1947) of Jammu is built at the very first rise (60-90 m) of the hills above the plain on the sloping hill and some 300—400 m above the mean sea level.

This is a part of the outer ridge of hills; the ridge is cut through by the narrow valley of the Tawi which flows out to the plains at a level more than 60 m below the hill over which the town has been built. In recent years urban limits of the city of Jammu have extended to its west, north-west and south.

In the south of the city there has been a wall in medieval times along the edge of the slope

connecting the interior through the guarded gates with the sloping land below. Bushy under-wood, though cleared now, served more or less as a line of demarcation to the west and north-west. It was within this narrow campus (4 km²) that the provincial headquarters were established. A fort built on the other side of the Tawi east of the city afforded further protection. The Municipal limits of Jammu till the year 1947 were well defined. The northern gate of the Ramnagar Palace (New Palace) in the north, the Ranbir canal-head in the west, the Tawi bridge on the south and the steep escarpment of the Jammu boulder bed to the east formed the limits of the city (Fig. 8.13).

The city proper is built on a high terrace of boulder conglomerates embedded in clayey silt that forms the western and northern bank of the Tawi for a distance of about 3 km quite above the high flood level. This type of topography has given to the city the name of "*Battian Wala Shehar* (city of rounded boulders) in Punjabi. The various advantages of the site not only attracted the early settlers to this habitable spot but also continued to exert their influence in the nature of its growth.

Like all medieval towns, the ruler's palace continued to be the hub of the town, and the area around (a big enclosed rectangular block) came to be known as *Raja-Ki Mandi*, used also by the Maharaja for attending to the public.

In 1890 Jammu was linked by railway through a branch of North Western Railway with Sialkot (now in W. Pak.). Jammu Tawi railway station was built to the south of the Tawi. This encouraged new settlements in this area also. The city expanded almost thrice its previous size. The areas built during the period 1890 to 1920 are *Kachi Chhawani*, *Parade Ground*, *Purani Mandi*, *Raghunath Bazar*, *Residency Road*, (now *Vir Marg*), *Urdu Bazar* (present *Rajinder Bazar*), *Rehari*, *Kanak-Mandi*, *Exchange Road*, *Ajaibgarh Road* and parts of the present *Krishna Nagar*.

Maharaja Hari Singh (1925-1947) extended the urban areas of Jammu in a planned manner. He was a builder of repute insofar as the new constructions on modern lines are concerned.

During his time even some of the medieval constructions were given a new look.

Soon after the Independence in the year 1947, the settled population of the Punjab and the Jammu region—outer plain and outer hills—was uprooted creating many problems on the rural-urban fringe of Akhnoor, Jammu, Samba and Kathua. This mass disturbance increased the population of Jammu city by about 52% including the natural increase. This resulted in congestion in the city and gave rise to attendant problems. However, some newly planned colonies came into being, of which Gandhi Nagar and Bakshi Nagar to the south and the west of the city, may be mentioned. Houses sprang up with a reasonable degree of modern facilities.

With urban expansion in recent years, new localities, namely Nai Basti, Industrial Estate, Digiana, Gole Gujral and other continuous linear extensions along the Jammu-Pathankot and the Jammu-Akhnoor roads have extended the urban limit. The Jammu-Pathankot highway is functioning like a spine for urban expansion and some stray colonies are coming up. The Akali Sant Singh Nagar and S. Kohar Singh Nagar may be mentioned as examples. The southward extension can be attributed to the physiographic advantage of this area over the northern hilly tracts.

The net of the metalled roads spread in the new localities is mostly rectangular in pattern. To the west of the old city flows the Ranbir Canal, northwest of Jammu. The canal helped in urbanising this area through which passes the main road to Akhnoor to the west of the Canal. These two factors—the canal and the road—promise further urbanisation towards the west and the northwest of the city. With the recent armoured attack by Pakistan near Akhnoor (Chhamb-Jourian Sector) just east of the Cease-Fire line, quasi-permanent settlements of military importance have sprung up.

The population of Jammu has almost trebled between 1901 and 1961 from 36,130 to 102,738, showing much faster growth rate since Partition. The southward extension of business area of the city has led to the decline of the old Dhowthli bazar which was located near the palace and

which was once the hub of traders from far and wide.

This southward-shifting trend of the functional hub of the urban activities from Dhounthli to Jain Bazar continued and reached Raghunath Bazar in the beginning of the thirties when this main road of the city was metalled and the new pucca houses started springing up in the vicinity of Raghunathpura, Kanak Mandi, Shalimar and Residency area. This area was having its advantages in respect of its being nearer to the railway station. Political division of the country in year 1947 resulted in disrupting the rail link with Sialkot. Therefore, the Jammu-Pathankot road was developed to maintain the desired physical connection of the State with the rest of the country.

The link Road, the Purani Mandi, the Sabzi Mandi, the Pucca Danga, the Kachi Chhawani, the Rajinder Bazar, the Vir Marg and the Raghunath Bazar are some of the living joints of urbanization in the fast changing urban pattern of the city. All these areas are having their own market centres.

The down-town trends of population and the new incentives for urbanization to the south and west of the city along the main highways is expected to result in the linear extensions. The topography of the surrounding country-side reveals that there is no provision for continuous coacentric extension to the north and the east. It may be necessary to have broader linear settlements, particularly along the Jammu-Pathankot Road. Attempts are being made, though not on any planned basis, to create small zones of feeding units to the city. The existing open spaces are not being properly maintained and the creation of the public gardens and play grounds are not being encouraged to suit the future urban growth of the city of Jammu. Keeping in view all the necessary factors, the new Railway Station should be properly located (Fig. 8.13). Also a second bridge over the Tawi should be constructed to relieve the existing bridge of its traffic jams. This could be easily done if the two bridges are allowed for one way traffic only. Also a good hotel, a cinema house, a sub-post office and a

branch of some Scheduled Bank should be instituted in the neighbourhood of the new Railway Station, when completed.

Pampore : (1961 pop. 5,568; Padmapura of Hindu period) is a class V town upgraded only in 1961. The town is situated in the Jhelum valley, 13 km south of Srinagar on N.H.IA. The houses are closely spaced and double storeyed; dwellers reside on the 1st floor during summer and on the ground floor during winter. Every house has a loft. The grain stores are a little away from the main house. The roof has a steep slope. Most of the houses are made of stone and sun-dried bricks, with copious woodwork on all the wooden constituents of the house. The town still retains by and large its rural character, and as such it lacks in the emergence of well-defined functional sections, although certain castes such as agriculturists and potters have their segregations in the north, south and east. In the central part there is majority of masons, businessmen and milkmen (Fig 8.9). Around the shrine of Khwaja Saheb in the south-east also the masons are concentrated. Tonga drivers are found mainly in the outskirts of the town. The houses of businessmen are clustered on either side of the National Highway. Saffron, wheat, rice, fruits, and vegetables are grown around the settlement. Pampore is especially known for its saffron cultivation.

Agricultural Economy

Agriculture is the mainstay of the people engaging about 42.8% of the working force. The primary sector in all employs about 80%. Other services (9.3%) and household industry (6.3%) are the other avenues of employment. The physical environment restricts the cultivated land to only 5% of the State area, thus exhibiting acute shortage of arable land. The ratio of arable land per agricultural worker is 0.6 hectare. Even this meagre proportion of agricultural land in the State is distributed quite unevenly (0.2% in Ladakh to 31.6% in Jammu). Regionally the valley has about 23% of its land under agriculture, accounting for about 48% of the States agricultural land while Jammu region with 13% shares about 49%. Doda dis-

tract has a very low proportion (4.7%) of the land under agriculture. A significant feature of agriculture is its intensive character, about 21% (146,000 hectares) of the net sown area (698,000 hectares) being double cropped as against 15% of the country as a whole. About 40% of the cultivated land is irrigated.

Agriculture alone contributes about 35.5% of State's income, while 16.9% is received from forestry and 8.6% from animal husbandry and fisheries (1960-61). Though 90% of the total cropped area is under food grains, yet it is food-deficit region due to low yields. The average size of the farm holding comes to be 1.5 hectares only exhibiting a heavy pressure on arable land (1953-54). There is little scope for extension of cultivation mainly owing to physical difficulties. The other sectors of the economy are yet to be developed to improve it and lighten the pressure on land.

TABLE 3

Districts	Net area sown as % of total	% of net area irrigated to net area sown	% of area under food grains to total cropped area
Anantnag	24.3	64.2	84.85
Baramula	20.2	50.9	92.11
Srinagar	23.7	67.9	81.76
Ladakh	0.2	99.9	77.18
Jammu	31.6	4.0	92.68
Doda	4.7	14.8	97.73
Udhampur	12.7	10.2	96.03
Kathua	23.8	19.6	87.95
Poonch	15.6	11.7	98.47
Total State	5.0	41.7	90.71

In the region the cultivation is extended to marginal lands taking the plough to the farthest limits and leaving small areas under cultivable waste and long fallows. Intensive terracing and watering through extensive *Kuhl* system, like that of the Himachal Himalaya are the common features, while canal irrigation is practised

in the valley plains. The *Nalis* connecting the fields are used as irrigation-cum-drainage channels. The terraced patches sometimes are so small that the cultivation has to be necessarily done by hoe. Climatic conditions and uneven distribution of irrigation facilities are mainly responsible for the regional disparity in agricultural land use and cropping patterns. Snowfall restricts agricultural activity in the valley to eight months only. While in the northern tracts, only one crop can be raised in a year, Jammu region bears two crops on account of its year-long growing season and adequate rainfall, including winter rain, though it irrigates only 15% of its total area as compared to about 60% in the Valley. Kashmir Valley is, however, the most productive agricultural region of the Region. In the dry Ladakh cultivation is done only with irrigation. Of the total irrigated area in the State, nearly 74% is through private canals, 24% through government lift irrigation and rural electrification has also started to further augment the irrigation potential.

Rice is the main crop of the Valley which accounts for 74% of the State's area under rice. Anantnag district alone accounts for about one-third of the States' rice acreage. Maize, though somewhat evenly distributed, is also more concentrated in the valley accounting for more than 2/5ths of State acreage. Baramula district leads with 21% of the total acreage, followed by Poonch (18.6%), Anantnag (14.5%), Doda (12.6%), etc.; while rice is the predominant crop of the Valley bottoms, maize becomes important on the valley slopes. These two crops also emphasize the significance of *Kharif* season. Millets are confined to Jammu and Ladakh; the latter accounts for 98% of ragi, while the former has the entire State's acreage under jowar and bajra. Wheat is mostly the crop of Jammu region (about 80%), where the Jammu district takes the lead with 37% of the State's acreage, followed by Kathua (14.7), Udhampur (11.5), Poonch (11), etc. In the Kashmir Valley the *rabi* cropping is confined only to 12% of the total area and that too follows the fallowing practice in *kharif*. The sowing is done before the snowfall, and real

growth of plants start after the ice melts in March. The cropping pattern in the Kashmir region is dominated by food grains, which account for about 90% of the cropped area. Rice (28%) ranks first, closely followed by maize (27.6)%. Wheat (20.8%) is the third important crop of the region. Secondary cereals and millets, and pulses account for 8 and 6% respectively. Among the commercial crops, oil seeds (5%) and apples are significant. Area under apples is mostly confined to the Valley of Kashmir. The region is the largest producer of temperate fruits in India.

Saffron regarded as a *rabi* crop is a very important commercial crop, but its cultivation is confined to Pampore, where the well-drained *karewa* soil and, drier and more sunny climate, especially during the summer and autumn, are the favourable factors. The yield per acre comes to 250 grams. The cultivation has been famous since long. "In the waqyat-i-Jehangiri, it is asserted that in an ordinary year 400 maunds of saffron were produced. Half belonged to the State and half to the cultivators. The price was Rs. 10/- per seer".¹¹

The agricultural yields per acre are low in the Kashmir region except in case of rice and barley.

A major portion of the area under cultivable waste as well as current fallows is in the Jammu province. The increase in irrigation facilities, consumption of commercial fertilizers and reclamation of cultivable waste in the Jammu province alone will change the structure of the land use pattern of Kashmir region as in other regions the scope is limited.

Pastoral Agriculture : Gujjars are principally engaged in buffalo-rearing. They move to the mountain pasture as the summer approaches and return to the lower slopes and valleys at the onset of winter; they are mostly confined to Jammu. Since grazing facilities are not available during the winter, the graziers have to store fodder and grass for their cattle for the full season in the Vale of Kashmir. Jammu is more fortunate in this respect as it provides grazing grounds in winter too in its forest and scrub lands. As such, the number of animals is lesser in the valley than in Jammu. The Gaddis also move to Hima-

chal in search of fodder. In the State as a whole there are 87 cows and 32 buffaloes per 1,000 persons, as compared to 47 cows and 29 buffaloes in the country. There is poorer milk supply in the region, though ghee supply is better.

Industrial Economy

Industrially, Kashmir region is very little developed, employing only 8.5% of working force of which about 74% are engaged in household industry. Manufacturing, including mining, contributes to only about 10% of region's income. Due to the lack of adequate facilities the existing industrial resources await exploitation, and the cost of transportation restricts the movement of raw materials from both within and outside the region. Thus the industrial activity is dominated by household industries for which high degree of skill and craftsmanship evolved partly because of physical isolation. Spinning and weaving are the most important household industry of the region.

TABLE 4

No. of artisans in 50 selected Development Blocks in Kashmir Region (1965) in %¹²

Weavers	33.34	Shoemakers	4.80
Carpenters	13.43	Tanners	1.84
Blacksmiths	8.36	Oilmen	8.87
Cobblers	10.28	Masons	6.17
Potters	8.02	Kangri-makers	4.89

The craftsmanship is mainly confined in the Kashmir Valley where 13,500 workers are engaged only in Srinagar area (1963). Here naturally the artisans have artistic imagination and long patience for minute works. The Kashmir Valley has a reputation in embroidery work, papier-mache, woollen carpets, imitation jewellery, wicker willow work, *Tush* making and wood carving. The embroidery work employs about 5,000 workers. The embroidered shawls known as *Pashmina* account for nearly 95% of the embroidery work. Carpet weaving is also done on handlooms. About 1500 workers are employed in wood-carving, particularly on walnut.

The household industries account for 59.3% of the net industrial output, and 61.6% of total workers in the industrial section.

TABLE 5
Registered factories in the Kashmir region* (1965)

Industry	Total	No. of Units		Average daily no. of workers		
		Govt.	Private	Total	Govt.	Private
Agro-based	10	...	10	304	...	304
Forest-based	35	1	34	911	28	883
Livestock-based	2	2	...	150	150	...
Mineral-based	2	1	1	132	120	12
Textiles	60	4	56	4,959	1,713	3,246
Chemicals	12	7	5	626	440	186
Engineering	30	...	30	719	...	719
Miscellaneous	39	3	36	1,809	361	1,448
Total	190	18	172	9,610	2,812	6,789

* Referring to Jammu and Kashmir State only.

Out of 190 factories in the Kashmir region 28 factories are classed as large, of which 9 are owned by the government. Mainly the industries are concentrated in Jammu and Srinagar districts which account for 82% of the region's industries. The district-wise distribution of industries is as follows¹⁴ :

TABLE 6

	No. of units	No. of workers
Srinagar	92	4,683
Baramula	11	275
Jammu	73	3,166
Anantnag	12	941
Kathua	1	500
Doda	1	45
Total	190	9,610

The valley of Kashmir has its own tradition in manufacturing industries. The *Pashmina* manufacture is as old as the Mahabharata times when beautiful shawls woven on the loom in exquisite art were exported to other parts of the country. There is mention of wood-carving, silver-ware, imitation jewellery and papier-mache in very early times.

A degree of perfection, it is obvious, was attained during a long period of civilised life to enable commodities of this region to compete in foreign markets. The handicrafts received princely patronage from very early times, and being light in weight and rich in value, could easily find market across the frontiers of India.

Though small handicrafts, these had the potential to develop into a suitable size with the diffusion of economic activity. The carpet weaving (Srinagar) is an industry of repute in the world market for its fineness and design. Dependent on cotton yarn imported from Amritsar this industry suffered a set back for its wool content after the Chinese invasion and occupation of Aksai Chin. There are about fifteen factories making carpets with more than 350 looms. The *Namdas*, a low grade carpet of wool, felted into a thick sheet engages about 2,000 workers in its finishing stage. Wool is now imported from Australia, U.K. and New Zealand. The manufacture of serges, tweeds, worsted and blankets has reached a high degree of excellence to make a bid in the foreign markets. In colour, texture, design and form these woollen products have been in demand with the recent processes of mixed fibres, like woollen cotton, woollen silk and woollen nylon.

Imitation jewellery (Srinagar) and silverware (Srinagar) did not go beyond the small scale limits as the industry is located requiring perfection for the products.

It may, however, be remarked that electric power has widened the scope of even the smallest enterprise as it brings in use small machinery for processes of perfection with delicacy and artistic skill. The Government Woollen Mill (Srinagar) employs 3,000 labourers making tweeds, blankets and woollen yarn. Half-wrought factory (Baramula), the Kashmir Willows (Srinagar),

the Kashmir Match Factory (Baramula), the Government Silk Weaving Factory (Srinagar), and the Drug Manufacture may be mentioned as some of the important units of production contributing towards a sound base for the industrial development for the Valley of Kashmir.

The textile industry of the region has employed more than 50% of the total industrial workers. The region produced 84,437 kg of mulberry silk in 1960 which shared 7% of the India's output of mulberry silk. This industry is concentrated at Srinagar, Sulina, Hawal, Rainwari (Dal Lake), Moghul Masjid and Chota Bazar with about 105 handloom units. As a widespread industry, silk-rearing is carried on in the countryside, providing raw materials for manufacturing about 750,000 yards a year. The Kashmir Silk Syndicate pools the factors of production of silk manufacture in the region where this industry is widening in its scope. There are 8 large-scale manufacturing factories in the region of which 3 (2 in Srinagar and 1 in Jammu) are Government-owned. The only government wool spinning mill with 1,200 spindles is located in Srinagar. In the Fourth Plan period there would be 6,000 spindles with the investment of Rs. 65 lakhs.

The textile industry of the region, specially the silk and woollen industries face an acute problem of shortage of raw materials. A large area under mulberry plantation has gone under the illegal occupation of Pakistan. The State has launched a programme for mulberry planting. Cement factory at Wuyan in Anantnag produces 60 tonnes per day. Limestone is available around Wuyan but coal is obtained from Bihar coalfields. A factory for ceramic wares like electric insulators and sanitary fittings with the annual producing capacity of 700 tons of ceramics promises a new place for a big industry.

Metalware and the engineering industries have grown to a fair size in recent years and the products have numerous uses. Some mineral-based industries have been developed in Baramula where coal (lignite) is mined at Handwara (Nichahom). Mention may be made of small workshops to process these materials into various products, using cheap power. The Mohora Power

Plant with a capacity of 4,000 kw is used for rice husking, flour-milling and silk manufacturing at Srinagar. The Sind Valley Hydro-Electric Project has a capacity of 13,000 kw and supplies electricity to tourists huts and cottage industries at Pahalgam.

Tourist Industry : Its natural landscape offers a variety of scenic spots which are significant source of attraction for tourist from all over the world. The industry is organised to meet their rush and demand. There are sufficient passenger services for the places of tourist interests, e.g., Gulmarg, Pahalgam, Sonmarg, Wular Lake, Achabal etc. from Srinagar. In the valley visitors can spend their long holidays in the numerous places of intrinsic loveliness. The period from March to October is most suitable for tourists.

TABLE 7
Number of Incoming Tourist
in Kashmir Region^a

Year	Home Tourist	Foreign Tourist	Total
1965	37,521	8,020	45,541
1966	112,127	7,149	119,276
1967	135,653	10,428	146,081
1968	129,750	10,946	140,696

Majority of the foreign tourists come from U.S.A. (54%) and U.K. (22%).

Transport

The Region has limited transport facilities, roads being the most important. Rail transport is conspicuous by its absence while river and air transport are of limited value. In the Kashmir region transport is a vital problem. Extremely rugged terrain in association with thick forest cover, frequent land slides and heavy snow-fall has hampered the development of surface transport in the region. Even now only the Pathankot-Uri link is most vital joining almost all the important towns such as Kathua, Jammu, Banihal, Anantnag, Srinagar, Baramula etc. From Srinagar there is a link to Ladakh. Pathankot serves as the main transshipment point for passengers and goods traffic. Roads are difficult to be maintained due to the nature of terrain, and their capacity is further hampered because of limited

width. The total road length classified by category and types of surface is as follows¹⁶ :

TABLE 8

Category	Road length in km (1965)
National Highways	430
State Highways	726
Major district roads	1,275
Other district roads	1,210
Village roads	3,574
Total	7,215

The road length has been doubled during 1956-65. On an average 400 km of road has been increasing every year between 1956-65.

Kashmir region has 3.3 km (all classes) of road length per 100 km², of which 60% are surfaced. When Ladakh is excluded, the region gets 15 km of road/100 km² of area of which 9 km/100 km² are unsurfaced. Even this meagre road length is unevenly distributed (Fig. 8.7). From the spatial analysis it is evident that the road density covaries with the population density.

Moreover, there are load restrictions on different sections of the highways; for instance, Pathankot to Jammu truck load carries only 7.5 tonnes, Jammu to Srinagar 5.8 tonnes, and on other routes 4.5 tonnes, which add to the transport cost. Mostly there is one way goods traffic which increases the cost.

The opening of the Jawahar Tunnel (1959) has not only boosted the road transportation but has also increased its capacity and usefulness.

The valley, the foothill plain and Mirpur-Muzaffarabad section have better transport facilities. Numerous short roads in the valley link the plaets of tourist importance, fruit growing areas, etc., among themselves as well as with the National Highway. The Valley accounts for about 53% of surfaced and 33.1% of unsurfaced oads, with density varying from 0.15 km/km² Baramula) to 0.25 (Srinagar).

Jammu province accounts for 46.6% of the surfaced and 37.1% of the unsurfaced road lengths of the State. The overall density varies from 0.07 (Doba and Udhampur) to 0.23 (Jammu) districts. There are three important roads in the eastern part of Jammu which link Dhar to Udhampur, Batote to Kishtwar and Doda to

Bhadarwah. There is no link connecting the N.H.IA., with Dhar-Uadhampur road. In the western part Jammu-Poonch-Uri link via Rajauri, Naushehra, and Akhnur with offshoots connecting Kotli, Mirpur, Bhimbar, Rawal Kot etc. is of strategic importance.

In the Ladakh region the only road is from Srinagar to Leh, which is still in part (Sonmarg-Kargil) only a fair weather road. Mule tracks still dominate in the region. Water transportation has been important in the valley from the very beginning. River Jhelum with its tributaries has been the chief bulk carrier of goods-building material, timber, foodgrain, fish and vegetables, since ancient times. However, the water transport is confined to the valley as the Jhelum is not navigable beyond Baramula.

There is no railway in the region except only upto Kathua which is only 6 km within the territory of the region, and which will be extended shortly upto Jammu. Air service is available to Jammu and Srinagar for civilian traffic from Delhi and from Chandigarh and Pathankot.

The Regions

In this region of mountain and valley complexes, where sharp physico-cultural distinctions within short distances are quite well-marked, there exist certain broad distinguishing elements which render possible the major regional divisions. Climate in association with the location of the region clearly distinguishes two first order divisions, i.e., 14—the *Kashmir Region South* and 15—the *Kashmir Region North*. The former is rather coterminous with the windward Kashmir and is characterised by relatively lower altitude under the shadow of the Himadri and existence of some broad basins; its opening into the Great Plains has fostered, from time immemorial, the concentration of almost all the human activities in the region. On the other hand the tangled high altitude mass of the Himalaya with alternating inaccessible snow-clad high ranges and deep valleys with precipitous scarps along with the vast, often snow covered platform forming a rain shadow zone presents an inhospitable environment for any but highly scattered pockets of human activities; this mostly Trans-Himalayan

region has now become of great strategic significance as well. The two first order divisions have been further distinguished into as many as 6 second order and 24 third order regions as follows (Fig. 8.14).

Regional Scheme

VII. Kashmir Region

14. Kashmir Region South

- (a) Kashmir Valley
 - (i) The Jhelum Plain
 - (ii) The Karewas (Terraces)
 - (iii) The Rimlands
- (b) Jammu-Mirpur Region
 - (i) The Foothill Plains
 - (ii) The Siwalik Region

(iii) The Lesser Himalaya or Pir Panjal Region

15. Kashmir Region North

- (c) Zaskar-Ladakh Region
 - (i) The Great Himalayan/Zaskar Region
 - (ii) The Sindhu Furrow
 - (iii) The Ladakh Range
 - (iv) The Upper Shyok Valley
- (d) Deosai-Skardu Region
 - (i) The Deosai Highland
 - (ii) The Deosai Plain or Skardu Region
 - (iii) The Astor Valley
 - (iv) The Nanga Parbat
- (e) Gilgit-Baltistan Region
 - (i) The Lower Shyok Valley



Fig. 8.14

- (ii) The Karakoram Range
- (iii) The Shigar Valley
- (iv) The Gilgit-Hunza Valleys
- (v) The Hindukush Region
- (vi) The Gilgit Massif-Sindhu Gorge Region
- (f) Aksai-Chin Region
 - (i) The Suget Range (Kun Lun)
 - (ii) The Soda Plain
 - (iii) The Ladakh Plateau
 - (iv) The Kara Kash Valley

The Kashmir Region South comprises (a) the Kashmir valley and (b) the Jammu-Mirpur region.

Set like a jewel in the tangled mass of the gigantic Himalaya, the Vale of Kashmir has attained high degree of cultural development in contrast to its untamed rims. This alluvium-filled oval depression of the Jhelum originally formed a structural Dun "seated on the back of a vast nappe" and was filled with a lake which was gradually drained out during the last interglacial epochs. The extent of the flat valley may be taken as the flood level of the Jhelum when the valley looks like the *Satisar*, the lake that it was before the Pleistocene times. The valley bottom is covered with recent alluvium varying in width from 3 to 25 km along the Jhelum. Though looking level, the plain has a fall northward of over 50 m in the first 55 km and only 18 m in the lower 40 km. The channel of the Jhelum flows close to the northern rim of the vale where the flights of spurs exhibit faulting, but these features are masked on the Pir Panjal side by the glacial fills. The valley is prone to floods very often.

Most of the Region's agricultural, industrial and allied activities are confined to this valley. This zone of convergence and diffusion of various streams of thoughts, has ever since served as the political and cultural nerve centre of the region by and large through its hub at Srinagar. With all its indigenous arts and craftsmanship, it has unique position for saffron culture also; rice and maize dominate the agricultural economy. The region has several places of tourist interest also.

Diversities too are numerous both physical as well as cultural which help in distinguishing as many as three sub-divisions: (i) the Jhelum Plain, (ii) The Karewas and (iii) The Rimlands.

The Jhelum Plain extends from Khanabal to Baramula and includes the flood plain and the Bahil tracts. In the flood plain the river meanders sluggishly overflowing its banks when in flood. Spring and Autumn are the seasons when heavy rainfall and snow melt in higher elevations increase the volume of water. Siltation is caused then, and what is more, fresh alluvium covers cultivated and cultivable land to the advantage of soil nutrients, and causes swamps as seen beyond the Wular lake.

The Bahil region flanking the flood plain constitutes the main agricultural zone of the valley and contains the "Rice Bowl of Kashmir" in the Kulgam-Shopyan area. As the elevated tributary valleys open into the main valley from the west and the east the cultivation extends higher up in one form or the other.

(ii) The *Karewas* are essentially the zone of uplands. Regarded by geomorphologists as the shelving shores of an inland sea and lacustrine in origin, the Karewas form a distinct formation from the alluvial fill of the rest of the valley and are also contrastingly infertile. Irrigation is a problem on the Karewa soil though notices in ancient texts appear about some sort of a wheel system of pulling up water as on the Damodar Karewa, the site of Srinagar aerodrome. However, irrigation facilities and pressure of population have pushed the frontiers of cultivation to these terraces. Maize is the dominant crop grown here, and fruit cultivation (apple, plum and almonds) is extending fast in the region.

(iii) The Rimland mountains around the valley rise above 3,500 m and are clothed with thick forests, mixed conifers in the north and deciduous on the Pir Panjal. In the winter snow covers the entire valley and the higher elevations remain covered up till the end of April. Logs are floated through the various streams into the valley. Higher slopes and meadows with grasses and clean water are used by graziers. Several tourist resorts like Gulmarg, Pahalgam etc. are of high importance.

Particular mention may be made here of the region which comprises part of Lower Himalaya, Jhelum gorge below Baramula and the Kishen-

Ganga valley, with an average elevation between 1,500-4,000 m. Truncated by the military aggression of Pakistan the nature of the region as a physical barrier has been accentuated. Muzaffarabad is the main urban centre at the confluence of the Kishen Ganga with the Jhelum; it is from here that anti-Indian *Muzahids* are trained and infiltrated into India.

Local landscapic variations are significant enough to distinguish fourth order regions in the valley. Based on the agricultural land use efficiency, the Jhelum Plain may further be divided into Eastern Verinag-Anantnag, Western Kulgam-Shopyan region, Khanabal-Sangam, Western Pulwama-Badgam, Sangam-Srinagar, Srinagar-Bandipur, Srinagar-Sopore, Bandipur-Sopore and Sopore-Baramula regions. Similarly, the Kashmir Karewas can be distinguished into the Martand Karewas, the Kuthar-Sinthan East, the Eastern Liddar valley, the Northern-Sind valley, the Lolab valley and Sopyan-Baramula West. The rich forest-clad rims can be subdivided into the Merve-Wadwan, the Kolahai-Amarnath, the North Harmukh, the Western Baramula, the Western Gulmarg, the Pir Panjal-Kutumarg West and the Jhelum Gorge-Kishen Ganga regions.

Jammu-Mirpur Region : The region covering the Jammu Province occupies the southern flanks of the Himalaya comprising (i) the Foothill Plains, (ii) the Siwaliks and (iii) the Lesser Himalaya (Pir Panjal) varying in elevation from 3,000 to 4,500 m in general, just touching the snow-line along its eastern border. This region forms the second most important economic and cultural part of the Kashmir region. Its opening into the Sindhu-Ganga Plain distinguishes it from the sheltered valley of Kashmir. Also the region, except in the Pir Panjal, seldom experiences snowfall, so common in the valley. The recent political changes have added to its strategic significance for the country as a whole and the region in particular. The *foothill plains* comprise the wheat belt of the region and contains the larger proportion of towns such as Jammu, the seat of the Dogras, Kathua, Samba, Mirpur, etc. The *Siwaliks*, as also in other Himalayan zones,

consists of forested and furrowed hills enclosing the structural depressions like *Dms*, notable being those of Udhampur and Kotli. It is in such depressions that rice cultivation has replaced wheat; elsewhere the Siwalik slopes with thin and eroded soil cover and limited means of irrigation are agriculturally poor. Maize, millets and barley are the main crops on the Siwaliks. With an abrupt ascent from the Siwaliks are met with the Pir Panjals (2,000-4,500 m) with almost bare scarp faces and forest-clad tops prone to seasonal snowfall. Population is sparse and human activities are also limited mostly to pastoralism. It provides access to the valley only through its passes, especially the Banihal, now tunnelled.

Kashmir North is divided into four second order regions : (c) Zaskar-Ladakh region, (b) Deosai-Skardu region, (e) Gilgit-Baltistan region and (f) Aksai Chin region.

Zaskar-Ladakh Region : constitutes the south-eastern part of the Kashmir region, comprising the almost uninterrupted stretch of the Himadri, the discontinuous stretch of the Zaskar encompassing within it the Zaskar and the Dras valleys, the Sindhu Furrow upstream from Skardu, the Ladakh range, upper Shyok valley and Chang-Cheng-Pangong complex. It is characterised by snow-clad ranges rising to more than 6,000 m and high altitude valleys lying between 2,000-4,500 m. But for the Himadri the area experiences scanty rain. The human activities, whatsoever, are confined to the valleys only. Ladakh is the land of Buddhist culture and people with Leh, (3,500 m), located on an extensive fan of over 8 km width in the Sindhu furrow, as the traditional regional centre. Naturally what Lhasa is to Tibet, Leh is to Ladakh. It is also of growing strategic importance being a regional route centre and its new route connection with Himachal will partly compensate the losses by the temporary disintegration of the trade routes from the central Asian nodes (Kashgar, etc.). Almost every village in Ladakh has its *Gompa* (monastery), built generally in a rather inaccessible high place. Ladakhis may be divided into *Champas* or nomads who are pastoral in the upland valleys,

too high for cultivation, and the Ladakhis proper who are settled in the valleys cultivating every patch of cultivable ground with good care in their traditional manner. They are mostly polyandrous; perhaps polyandry being a check on population is responsible for the relative prosperity of the Ladakhis as compared to the general poverty of the Baltis.¹⁷

The *Himadri-Zaskar Region* distinguishes itself by the higher altitude along with relatively higher rainfall (50-100 cm) and thicker forest cover than its counterparts in Ladakh. It can be further subdivided as the Himadri, the Northern Zaskar, the Dras valley, the Zaskar valley and the Southern Zaskar region including the Rupshu Plain. Rupshu country in general is filled with great land-locked and brackish lakes; Rupshu lake covers an area of about 150-170 km² and Tsomoriri is 24 km in length lying at an elevation of about 4,500 m. Kargil is an important regional centre in the Dras valley being connected with Leh by all weather highway. The Shyok, with its tributaries, the Galwan and the Chang-Chenmo, is significant between the Karakoram and Chan-Cheng mountains and is fed by glaciers. The rivers get lively in summer after the dread and frozen winter and with melt water the Shyok itself becomes "a clear rushing stream", about 10 m wide and is thus intermittent. The overall drainage pattern is peculiar here and the Chang-Chenmo seems to be a misfit. Its flood plain grows some vegetation like Tamarisk while the slopes are clothed with *barise*; higher up are the patches of grass which support the Yaks and wild asses. Hot spring waters are used for agriculture on the gravelly plain. The upper Shyok (Chip Chap) includes the Dapsang Plain which seems to be a high peneplain dissected as a result of an uplift as evidenced by various erosion levels.

The *Sindhu Furrow* is an almost straight and highly incised, but now graded longitudinal valley between the Zaskar and the Ladakh ranges and accounts for most of the human activities of the region. The valley is dominated by *Hemis Gompa*, the famous Buddhist monastery. Though the Indus furrow is barren, rocky and dry in general, it is dotted with fans built by the snow-

fed tributaries; it is here that the fruit trees and arable lands with barley as the main crop are met with. About 35 km east of Leh fans disappear and swampy fields in contrast to the green fans are seen. Beardless barley (*grim*) is also grown on the slopes at about 4,500 m height. Wheat, pulses and root crops are grown only on the irrigated fans. The sheep and Yak are reared by the semi nomadic people. Dzo (a cross breed of the cow and the Yak bull) is draught animal as also beast of burden.

The *Ladakh Range* (4,500-6,000 m) with almost regular crest and limited snowy peaks has gentler northern slopes with rather pre-glacial mature relief as evidenced by rolling surfaces even at the heights of over 5,000 m. The narrow valleys of 2 to 3 km width are found separated by low divides and the headwaters move sluggishly enough to form sandbars but downward after breaking through the morainic deposits their gradients become very steep (about 1 in 3) through their boulder choked-gorges. These river valleys show clear evidences of pre-glacial erosion levels, though affected by interglacial uplift. Though in general the region is very inhospitable for human occupance, grazing and pastoral activities are carried on favourable slopes.

The *Deosai-Skardu region* is subdivided into 4 third order regions (i) the Deosai Highlands, (ii) the Deosai Plain or Skardu Region, (iii) the Astor valley and (iv) the Nanga Parbat. The *Deosai Highland* with an average elevation between 4,500-6,000 m, rounded and flattened ridges and rather relatively broad valleys represents an erosion platform. The *Skardu Region* with an elevation from 2,000-4,000 m, shows evidences of rolling mature or late mature surfaces. The plains are generally dry and stony with some patches of grass, and frequent occurrences of swamps and bogs. The pastures are not used intensively and the malarial climate also makes it inhabitable. Skardu is the regional centre on the Indus near the confluence of the North Shigar, lying as it does on the traditional trade route through Muztag pass to Kashgar. The *Astor Valley* between the Deosai Highlands and the Nanga Parbat forms a transition. The

region, though dry, grows several crops like wheat, barley, buckwheat, maize and pulses along with lucern and other fodder crops through irrigation. Astor is the regional centre with post and telegraph office, rest house, inspection bungalow and dispensary. Downwards Doian is another centre with a rest house. The *Nanga Parbat* mountain complex is separated from the main mass of the Himadri by the Kishen Ganga and Astor valleys, the Burzil pass lying in between. Towards the north is the Sindhu gorge. It differs from the Himadri in several ways. "Located at the structural interference of two major geanticlines, both of which had undergone repeated uplift in the quaternary" it has a gneissoid gneissic core capped with sedimentary gneisses. In contrast to the NW-SE strike of the Kashmir Himalaya, it has a NS strike. To the exclusion of nappes, the late Tertiary and early Quaternary sandstones in the north are folded to form steep syncline along the Sindhu valley located "in the crystalline zone".¹⁸ The massif with about 260 km² of snow fields drains into small glaciers descending 2,440 m below the snow-line and exhibits erosional platforms at 3,960 m with rounded and flattened ridges and broad rudimentary valleys resembling the old morphology of the Deosai Highlands.¹⁹

The *Gilgit-Baltistan* lies between the west of Gilgit to the east of Nubra (from Hindukush to Karakoram), mostly snow-covered. Baltistan gets about 15 cm rainfall and has more glaciers. Agriculture here has more favourable environments than Ladakh though dependent on snow-melts. Barley and naked barley are dominant crops and lucern is the main fodder. Peaches, melons, grapes, apricots etc. are the main fruits; some tobacco is also grown. However, social institutions keep the Baltis poorer than the Ladakhis. In Gilgit area settlements and agriculture are found on the watered valley terraces. Gilgit has a strategic and nodal location near the confluence of the Gilgit and the Hunza rivers. Rice, cotton, wheat, barley and fruits are the main crops. Hunza has better conditions and grows, apart from several crops, fruits and fodder on its terraced fields with *kubli* irrigation.

The Lower Shyok valley with its tributary Nubra suffers from severe floods caused by the backwaters of the Indus, which lead to destruction of some riverine cultivated lands. The usual crops of barley, wheat and fruit along with some fodder are grown. Fields are carefully fenced, terraced and irrigated. The Shigar valley has few isolated settlements with barley, buckwheat and fruit crops. The Indus gorge 20-25 km wide, and 4,572-5,182 m deep lies between the Nanga Parbat and Gilgit massif. It is a hot and arid strip looking like a desert embedded into icy gravels. It was rather depopulated by the great flood of 1841 caused by landslide blockade near the confluence of the Astor. Bunzi is the regional service centre. Around it there are 3 to 5 lacustrine gravel terraces. The Hindukush is a high mountain complex, the heights ranging between 6,095-6,705 m with snow caps; only a part of it lies in Kashmir. Only the tributary valleys have few scattered settlements. Waters also flow to the Wakhan, the valley of the Ab-i-Panja, a tributary of the Oxus. Thus the region can be subdivided into 6 third order regions; (i) the Lower Shyok valley, (ii) the Karakoram Range, (iii) the Shigar valley, (iv) the Gilgit-Hunza Valleys, (v) the Hindukush region, and (vi) the Gilgit Massif—Sindhu Gorge region.

The *Aksai Chin* is generally desolate and the driest part (about 6,000 m) of the Kashmir region. The area suddenly caught strategic importance when China engulfed about 41,500 km² of this area through naked aggression in 1962. The region is divisible into 4 lower order regions based on varying terrain features: (i) The Kun Lun lying in the NE is snow-covered almost throughout. Below it lies (ii) the Soda Plain; (iii) the Central Plateau (Ladakh Plateau) is studded with a number of glacial lakes often forming inland drainage basins, and part of it is almost permanently frozen. (iv) The Karakash valley occupies the western and NW part of the region and drains it northward beyond the region.

Problems and Prospects

The Kashmir region with the enormity of its size and paucity of human resource and strategic

location in the Himalayan realm offers several challenging problems, geopolitical, social and economic. The early British contribution to the geopolitical issues of the region by promoting the buffer character of Tibet and Afghanistan (especially through the Wakhan) no longer holds in the context of the present political set-up in the Asian, if not the international, realm. The American interest in Gilgit, the Chinese interest in Aksai Chin and the changing policy of the Soviet Union, particularly in respect of Pakistan, and, above all, the Pakistani interest in Kashmir region, all are responsible for the present malaise and instability.

Under the prevailing geopolitical situation, attempts to forge ahead the process of economic and social integration with the rest of the country are foiled. The Government of India through its successive Five Year Plans and through granting special aids and concessions has tried to open up the region from its traditional aloofness and physical isolation. The development of the National Highway upto Leh through the Jawahar Tunnel is a distinct achievement, and at least along it new outlook and patterns are visible. Likewise, linking up Leh with Himachal and beyond with U. P. Himalaya with accompanying infrastructures will go a long way in integrating the Himalayan territories. What is needed then is linking up of Srinagar and Leh with Gilgit area which of course is bound up with political problems.

Even under the present circumstances, economic uplift and integration of the hitherto accessi-

ble region with the rest of India will in its turn indirectly pull-in the people of the outlying areas and may pave the way for political and social integration as is brewing up in the Aizerbaizan (shared by Iran and the Soviet Union); in this region too the tendency of frequent infiltration from the Muzaffarabad side is partly motivated by the lure of better life and prosperity in the valley of Kashmir.

The foregoing analysis of the regional personality reveals that the State's potential resources in the form of rich forests, green meadows and pastures, charming landscapes, abundant snow-fed water for power and irrigation, traditionally acquired skills for arts and crafts, and production of quality fruits and nuts are adequate enough to build a sound economic base; the fertile soils of the valley, river terraces and other parts are capable enough to produce abundant food and raw materials not only to replenish the deficiencies but also to lead to industrial development. All this would generate forces of economic growth to the advantage of the region as well as the country. As of now, the State is not able to raise the required capital resources and attract skilled man-power and other infrastructures from other regions mainly owing to restrictive land legislation (the only legacy of the Dogra rule); if the region is kept at par with the other regions of the country into settlement and re-settlement of the pioneer areas, it will certainly go a long way in mitigating the forces of underdevelopment.

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The Himachal Region ($32^{\circ}22'40''$ — $33^{\circ}12'40''$ N and $75^{\circ}47'55''$ — $79^{\circ}04'20''$ E) has an area of 56,019 km² and a population of 2.81 million (1961) covering the State of Himachal Pradesh. It lies to the south of Kashmir, to the north east of Punjab Plain, to the north west of Uttar Pradesh and to the west of Tibet. It is a hilly and mountainous region known for the natural loveliness of its mountains, forests, rivers, and valleys which are rich in cultural and human elements. Being a border State, it is an area of high strategic significance.

Administratively, Himachal Region is divided into 10 districts : Mahasu, Kinnaur, Mandi, Chamba, Sirmur, Bilaspur, Simla, Kangra, Kulu and Lahaul and Spiti (Fig. 9.1).

Historical Background

The Himachal was known during early times as *Dev Bhoomi* (the land of gods). Numerous places, peaks, rivers, lakes, springs and temples became places of pilgrimage because of the sanctity of their associations. According to the Puranas, Himachal is the 'Jalandhar Khand' of the Himalaya. In praising the glories of Himachal the Skand Purana says : "In a hundred ages of the gods, I could not tell thee of the glories of the Himachal". Streams of pilgrims, Buddhist monks, merchants and travellers from Central Asia, China and Tibet travelled across to Kulu, Mandi (Zahor), Rampur, Kangra (Nagar Kot) and the plains of India. From different parts of India, pilgrims came to pay their homage at the temples of Nagarkot, Jwalamukhi, Chintpurni and Naina Devi.

"There is no doubt that human habitations had been established long before the Aryan infiltration".¹ The aborigines of the hills are represented by such tribes as the *Kolis*, *Halis*, *Dagis*,

Dhaugris, etc., who now constitute various scheduled castes and tribes. *Da*, the Central Indian Kolian expression for 'water' is still used for many of the smaller streams of Simla Hills.² The other tribes of the region are *Dasas*, *Khasas*, *Kinnars* and *Kirats*. The Aryans came to the hills at a very early period and probably before the hymns of Rigveda were compiled. There has been a certain amount of fusion between the Aryans and hill tribes by degradation from 'high' castes and inter-caste marriages. There is also admixture of local and Tibetan strains, particularly in the northern and eastern border region.

Panini³ refers to several hill tracts like Trigarta, Kuluta (Kulu) and Mandamati (Mandi) etc. Formerly, the Kingdom of 'Jalandhar' or Trigarta (the land of 3 rivers, the Sutlej, the Ravi and the Beas) comprised all the country between the Sutlej and the Ravi and the 'Jalandhar' Doab in the plains. Kangra, then called Bhimkot, was its hill capital. The Katoch dynasty of Kangra is of great antiquity. Sir Lepel Griffin refers to the Rajput dynasties of the hills of whom the Katoch is the oldest as having "genealogies more ancient and unbroken than can be shown by any other royal families in the world".⁴ Cols, Jenkins and Harcourt remark that "While our ancestors were unreclaimed savages, and while the Empire of Rome was yet in infancy, there was a Katoch monarchy with an organized government at Kangra". The founder was Susarma Chandra, a King of Mahabharata days. The original seat of the family is said to have been at Multan but after the Mahabharata war, they lost it and retired to Jalandhar and occupied the hill tracts. Hiuen Tsang mentions about the kingdom of Jalandhar in his accounts. In A. D. 883, the region became subject to Sankar Varma King of Kashmir, mention to which is found in

Rajtarangini. Nagarkot (modern Kangra) famous for the riches and reputation of its temple, attracted the cupidity of Mahmud of Ghazni (A. D. 1009). Ferishta says of Kangra "Priests and princes used vessels of silver and gold and

were dressed in embroidered silk. History and philosophy were studied and commentaries written on books older than the Assyrian empire".⁵ In A. D. 1043, the region was recaptured by Rajput princes. There were some Muslim



Fig 9.1

incursions and since A. D. 1337, the territory often changed hands between the Muslim rulers and local Rajput chiefs. Akbar sent Todar Mal to annex the area. It is recorded that even at that time Kangra was famous for the treatment of

eye diseases, plastic surgery, *basmati* rice and its strong fort. Jahangir also was so charmed by the natural beauty that he laid plans for a palace to be built at Kangra. However, it is noteworthy that being sheltered by hills and mountains the

area escaped the successive and violent waves of Muslim invasions which in the plains of Punjab nearly swept away all monuments of the old Indian civilization. The result is that ancient remains are more abundant and well-preserved here than in the plains. The Himachal Region is rich in antiquities and is invaluable to students of India's ancient history and culture.

Then as the Moghul empire became weak, the Rajputs again took possession of the territory. By A. D. 1773, Sansar Chand, a great patron of arts and crafts, became the supreme ruler. During his reign the hill kingdom witnessed its golden age. He was defeated by Ranjit Singh in 1804 and by the Gurkhas later. The Gurkhas laid waste the country—"grasses grew up and tigresses whelped in the streets of Nadaun". After devastating the country, the Gurkhas retreated but the Kangra Fort and some villages had to be surrendered to Ranjit Singh. Moorcraft on his way to Ladakh visited the court of Sansar Chand in A. D. 1820 and remarked that "his peasantry was resolute and warmly attached to him". By about the early 19th century, the area came under British control. The Simla tract was annexed by the British after the Gurkha war of 1815-16. Since 1864, Simla became the summer headquarters of Government of India and since 1871 of Punjab Government as well.⁶ The British rule lasted for almost a century and a half. During this period, there was development of means of transport and communications, education, agriculture, and trade and commerce. The portion under princely states remained comparatively less developed.

Himachal Region at present comprises an integration of former hill states and areas ceded by Punjab. Himachal Pradesh first came into being as a centrally administered territory on April 15, 1948, by the integration of 30 former Punjab hill states. Bilaspur, another princely state, which remained a part 'C' state was merged with it in 1954. The region had an area of 28,192 km² and a population of 1.35 million till October 1966. On November 1, 1966, as a result of reorganisation of Punjab State, certain parts of Punjab were transferred to Himachal Pradesh

under the Punjab Reorganisation Act of 1966. These comprised the districts of Kangra, Kulu, Simla and Lahaul and Spiti, and parts of Hoshiarpur, Gurdaspur and Ambala districts. Thus the Himachal Pradesh emerged in its present form with an area of 56,019 km². Majority of the population is Hindu. Nearly 39 dialects are spoken but the principal language is Western Pahari, a form of Hindi which is now the State language. Now the region has been granted full Statehood thus making it the 18th State of India. The achievement of Statehood for the region will boost the confidence and tempo of development. Dr. Y. S. Parmar, the Chief Minister of Himachal Pradesh, has expressed eloquently, "The Himachal of my dreams is different from mere idyllic world of mountains. It has the potential for being one of the richest States of India".

The Physical Setting

Geology

The area stretching from Kashmir to Himachal is one of the most complicated geological regions of the Himalaya (Fig. 9.2). The region falls into four broad stratigraphical zones : 1. Outer or Sub-Himalayan Zone, 2. Lower Himalayan Zone, 3. Higher Himalayan Zone and 4. Tibetan or Tethys Himalayan Zone.

Outer or Sub-Himalayan Zone : Also known as the Siwaliks, the foothill zone (of the Punjab Himalaya) consists predominantly of Tertiary formations, extending from Northwest to South east. This system comprises of great thickness of detrital rocks, clays and conglomerates. The Nahans are separated from the Eocene beds of the Lesser Himalaya by the Main Boundary Thrust which probably measures the whole length of the Himalaya right from Assam to the Beas, demarcating the northern boundary of the Siwalik series.⁸ "So far very little is known about the actual current directions responsible for the distribution of sediments." The Siwalik chain is widest in the valley of the Beas. On palaeontological grounds the Siwaliks can be subdivided into three main groups : (i) Upper, (ii) Middle and (iii) Lower (or Nahan). The Sirmur series are also represented by 3 groups : (1) Kasauli,

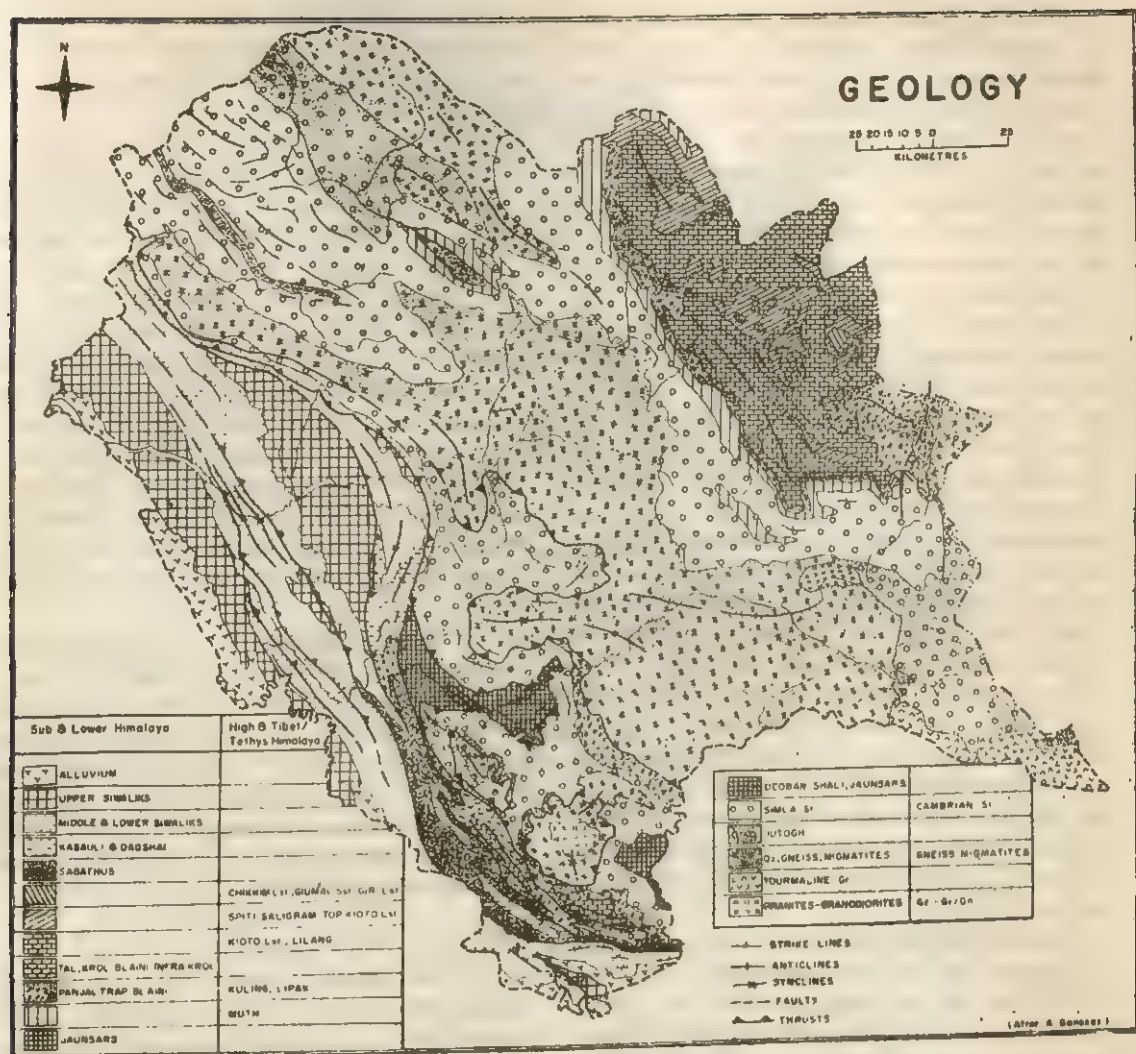


Fig. 9.2

(2) Dagshai and (3) Sabathu. The best and atleast for the lower formations, the thickest depositions of Murrees and Siwaliks occur in the Punjab section of the Himalaya.⁹ The thickness of Siwalik here ranges between 1,800—2,700 m. The Sirmur series are separated by a fault from the Siwalik series, and it is along this fault line that the epicentre of Kangra earthquake (1905) was situated. Kasauli deposits consist of grey or purple sandstones. Dagshai deposits also consist of grey or purple sandstones but with

bands of bright red or purple homogeneous clay. The Sabathu deposits consist of greenish grey or red gypseous shales with bands of limestone and sandstone. The whole of the Sirmur series appear to be perfectly continuous and conformable group of deposits. The lithological character of the three stages may be represented predominantly by conglomerate, sand rock and sandstone.

Lower Himalayan Zone lies between the 'Main Boundary Thrust' and the 'Central Himalayan Thrust'. Most of the part of this zone is

composed of granite and other crystalline rocks of unfossiliferous sediments. The Krol belt, stretching from the Simla region towards the east continuing almost throughout the Garhwal and Kumaon Himalaya, separates this region from the Siwalik system. The oldest and most characteristic rocks of the Simla Krol belt are the Simla Slates. These rocks are of dark unaltered slates and micaceous sandstones. Metamorphosed rocks are overthrust on the Simla slates.

The Eocene rocks are referred to as Subathus, from a place near Simla, which consist of calcite-veined olive shales, green and white sandstones and ferruginous quartzites and calcite-veined shaly limestones with some nummulites. The Jaunsars follow the above series. The rocks of Chandpur series, separated by the thrust, are characterised by a most conspicuous banding of fine quartzites and phyllites. The Shali section consists of quartzites at the base followed by the lower Shali limestones in which stromatolite structures have recently been observed.

The overlying deposits of the Krol belt have been subdivided into four categories : (i) Infra Krol, (ii) Sandstones, (iii) Krol limestones and (iv) Tal quartzites. The Chor granite, unconnected with the unmetamorphic sediments, tops the synclinally arranged Jutogh-Simla beds and belongs to the Almora-Dudatoli thrust zone of the Kumaon Himalaya.

The unconformable and rather complete palaeozoic section in the Lower Himalaya is suddenly interrupted by the transgression of the Permo-Carboniferous with an outstandingly different Gondwana rock sequence. The volcanic activity is well preserved in the Pir Panjal range, the formations being known as 'Panjal volcanics' or 'Panjal Traps'. Lithologically, these beds are composed of variable thickness of cherts, siliceous shales, carbonaceous shales and flaggy beds of quartzites.

Higher Himalayan Zone can be recognised only in the eastern part of the region covering the southern part of the Spiti region. The rocks lack fossils. The granitic rocks and granite-gneisses are well outcropped intermittently within the metamorphics south of the Spiti region and

also along the Sutlej. Here, severe tectonics have affected the crystalline rocks and led to the formation of the crystalline Klippen as in the Simla area.

Tibetan (Spiti) or Tethys Himalayan Zone : On the north of the crystalline rocks of the Higher Himalayan zone there follow sediments of the wide basin known as Spiti region covering the Spiti valley. Here, a nearly complete sequence of fossiliferous Palaeozoic and Mesozoic strata is laid bare. The axis of the syncline is NW-SE, following the trend of the Himalaya. The youngest Mesozoic formations are obviously exposed in the central part of the basin. The base of the sedimentary column in this region is formed by argillaceous metamorphics, where mica schists, more or less rich in kyanite, staurolite and garnets are predominant. The rusty ferruginous slates are a characteristic landmark in this region.

The Giumal sandstones with yellow-brown sandstones and quartzites conformably overlie the Spiti shales. North of the Giumal sandstones, lie grey limestones with soft grey calcareous shales, the tip of which is named as the Chikkim limestones. The richness in fossils and the nearly continuous well-exposed sections have made Spiti region world-famous which surprisingly remains unstudied so far by the geologists.

Relief

Himachal region is veiled from the Punjab Plains by Siwalik Hills. It is a hilly and a mountainous tract with altitudes ranging from about 450 m to 6500 m above sea level (Fig. 9.3-A).

The region presents an intricate mosaic of mountain ranges, hills and valleys (Fig. 9.4).

The white snow-clad peaks are the most prominent landmark. The Dhauladhar range looks in supreme majesty over the Kangra Valley while the Pir Panjal, the Great Himalayan and the Zaskar ranges stand guard over Chamba, Lahaul-Spiti, Kulu and Kinnaur. The majestic array of hoary peaks is visible from far and wide. The mountain slopes are covered with forests and meadows. The peaceful valleys below are interspersed with numerous streams, fields and quaint

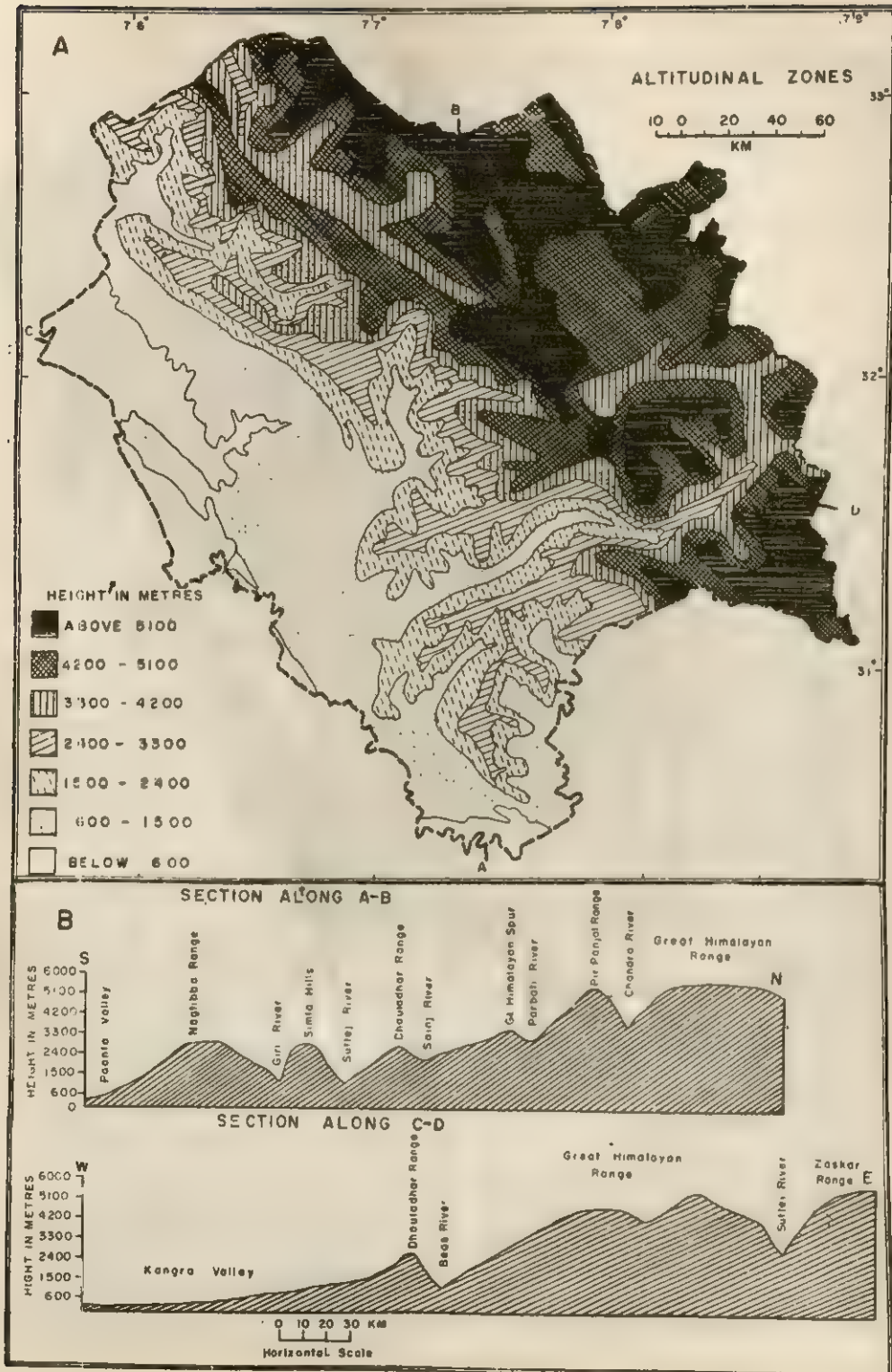


Fig. 9.3



Fig. 9.4

homesteads. The rolling downs are strawn with boulders. Seen from a vantage point the lower hills appear like ripples of the sea, suddenly arrested and frozen into stone. No scenery presents such sublime and delightful contrasts. "No-

where in the world the small natural regions are more sharply separated than in the Himalaya."⁴⁰

There is general increase in elevation from west to east and south to north (Fig. 9.3, B). The three physiographic divisions from south to

north are : (i) Outer Himalaya or the Siwaliks, (ii) Lesser Himalaya or Central Zone and (iii) the Great Himalaya and Zaskar or Northern Zone.

The southern zone consists of low hills of Siwaliks (about 600 m). The southern slopes are scarped while they dip gently to the northern structural valleys known as *duns*. "The conspicuous longitudinal depressions called *duns*, are not only the result of the constant structural trend parallel to the Himalayan range but show also the facies changes of the Siwalik rocks from north to south, the lithology remaining surprisingly constant along the strike".¹¹ The Siwaliks were known to ancient geographers as 'Mainak Parbat'.¹² Siwaliks literally means 'tresses of the Shiva'. They are composed of highly unconsolidated deposits which easily lend themselves to erosion. They maintain almost a regular course from Ravi to Yamuna in the south of the region. Siwaliks have been highly deforested and eroded resulting in the formation of *Chos*.

The Lesser Himalaya is marked by a gradual elevation towards the Dhauladhar and the Pir Panjal ranges. In the south the rise is more abrupt in the Simla hills. To the south of Simla is the high peak of Chaur (3,647 m). North of Sutlej the rise is gradual. The series of parallel ranges are divided by longitudinal valleys, the only exception being Kulu valley which runs transverse to the main alignment. Near the plains the features of hills and valleys are somewhat distinct but beyond the Chintpurni, Solasingshi and Mussoorie ranges, the hills and dales intermingle, and successive ranges and valleys continuously increase in elevation. Kangra valley is a longitudinal trough at the foot of the Dhauladhar range. The various streams and rivers have carved out valleys, the main being those of Ravi, Beas and Sutlej. Dhauladhar or 'the white Range' forms a most striking feature. It branches off from the Great Himalayan range near Badrinath. It is intercepted by the Sutlej at Rampur and the Beas at Larji and by the Ravi S. W. of Chamba. The northern flank of the Dhauladhar range impinges against the southern

flank of the Pir Panjal range (average peak elevation 4,600 m) at the mountain knot of Bara Bangahal. The mean elevation of Dhauladhar is about 4,550 m. Above the Kangra valley the rise of Dhauladhar is quite abrupt (3,600 m).

The Pir Panjal, the largest of the Lesser Himalayan ranges, bifurcates from the Great Himalayan Range near the bank of the Sutlej forming the water-parting between the Chenab on one side and the Beas and Ravi on the other. It bends towards the Dhauladhar range near the source of the Ravi. South of Lahaul, a considerable area rises above the snow-line and numerous glaciers exist. Rohtang Pass (4,800 m) and several other passes lie across it. Most of the passes are closed from December till March.

The Great Himalaya range (5,000-6,000 m) runs along the eastern boundary and is cut across by the defile of the Sutlej. The range separates the drainage of the Spiti from that of the Beas. There are certain famous passes across the range such as Kangla (5,248 m), Bara Lacha Pass (4,512 m), Kanzam (4,551 m), Parang (5,548 m), Pin Parbati (4,802 m).

The Zaskar range is the easternmost range and separates Spiti and Kinnaur from Tibet. It has peaks over 6,500 m, Riwo Phargyul (6,791 m) and Shilla (7,026 m). Gumsrang and Sholarung passes connect the basin of Sutlej with its basin in Tibet. The Zaskar range is cut across by the Sutlej through its Shipki defile. There are many glaciers over the Zaskar and the Great Himalayan ranges.

There are indications of extensive glaciation during the Ice Age and the present glaciers are merely 'shrunk remnants'. Enormous heaps of terminal moraines, now grass and tree-covered, ice-transported blocks with smoothed and striated surfaces, hanging and U-shaped valleys and glacial lakes are notable features of the past glaciation. In Pir Panjal above 2,000 m the mountains have a glaciated aspect while the valleys are filled with moraines and fluvio-glacial drift. "On the southern slopes of the Dhauladhar range an old moraine is found at such an extraordinary low altitude as 3,660', while in some parts of Kangra, glaciers were at the time believed, though.

not on good evidence to have descended to 3,000 ft. level¹¹⁸. There are numerous river terraces as observed near Kangra, Mandi and Kulu.

Drainage

The Himachal region has the unique distinction of providing water to both the Indus and the Ganga basins. The major river systems of the

region are the Chandra-Bhaga or the Chenab, the Ravi, the Beas, the Sutlej and the Yamuna (Fig. 9.5). The catchments of these rivers are fed by snow and rainfall and protected by fairly extensive cover of natural vegetation.

The Chandra Bhaga (Vedic, Asikni), the largest river (in volume of water) in Himachal is the joint stream of the Chandra and the Bhaga.



Fig. 9.5

The two streams have their origin on the opposite sides of Bara Lacha at an elevation of 4,900 m. After their confluence at Tandi, the Chandra

and Bhaga flow as a joint stream (also known as Chenab) for 122 km before entering Kashmir. Throughout this length the valley of the river

is a structural trough formed by the Great Himalaya and Pir Panja ranges. Its average bed slope is 1 in 150. The Chandra "passes through a totally barren land where there are no signs of life, the solemn mountains clad in eternal snow lying on its either flank. No villages adorn its banks, no attempts at cultivation, no signs of human life are to be met with and nothing greets the eye but the never-ending monotonous cliffs, which are lapped by the fierce stream as it rushes in wild fury against its banks".¹² The Chenab with a length of 1,200 km has a catchment area of 61,000 km² out of which 7,500 km² lie in Himachal.

The Ravi (Vedic 2,000 B. C., Parushni, Sanskrit 1,000 B., C., Iravati) rises in Bara Bangahal as a joint stream formed by the glacier-fed Bhadal and Tant-Gari and escapes from the area through a precipitous gorge. The river with its length of about 158 km in Himachal has a catchment area of about 5,451 km². Chamba town lies on its right bank.

The Beas (Vedic-Arjikiya, Sanskrit-Vipasa) rises in the Pir Panjal range near Rohtang pass, at an elevation of about 4,000 m and flows for about 256 km in Himachal before debouching on to the plains at Mirthal. The river is joined by a number of tributaries, the more important ones being the Parbati, the Hurla, the Sainj, the Tirthan, the Uhl, the Suketi, the Luni, the Awa, the Banganga, the Manuni, the Gaj and the Chaki; northern and eastern affluents are perennial and snowfed while the southern are seasonal. The Beas pierces the Dhauladhar range at Larji. After Larji the gradient becomes gentler. South of Larji the Beas crosses through a steep defile below Mandi and then passes on to undulating tract of south Kangra. The maximum mean monthly discharge at Mandi during August is 129,574 cusecs and minimum mean monthly discharge during January is 3266 cusecs. Floods occur in the Beas usually in late August or September. However, the measure of a river's efficiency lies in its average flow which for the Beas is 61,302 cusecs in August and 4641 cusecs in January.¹⁵ The average bed slope is 1 in 40 for first 120 km from its source which decreases

to 1 in 5,000 near plains. There appears to be a likelihood of water-parting between the Beas and the Sutlej to recede further to the north as Sutlej flows in a deeper channel at corresponding points.

The Sutlej (Vedic, Sutudri; Sanskrit, Shatadru) has its origin in the distant highlands of Tibet. It flows for a distance of 400 km almost parallel to the Indus and then cuts right through both the Zaskar range and the Great Himalaya "thus forming perhaps the most striking physical feature of the region".¹⁶ It crosses the Indo-Tibetan border near Shipki la. The Spiti river joins it at this point from the north, beyond which it flows in south-westerly direction in Himachal. It then emerges from the mountains at the Bhakra gorge where the Gobind Sagar is impounded behind the Bhakra Dam. The Trans-Himalayan portion of its basin receives but little rain. The upper catchment of about 50,140 km² is located above the permanent snow line at an elevation of 4,500 m. The total catchment area up to Bhakra Dam in Himachal region is 20,000 km². The bed slope from its source upto Bilaspur averages 1 in 150.

The Yamuna rises in Yamunotri in Uttar Kashi (U. P.). The total catchment area in Himachal is 2,320 km². The river after flowing in a S. W. direction upto Banog turns westwards before it is met by its principal tributary, the Tons at Kalsi about 48 km from Dehra Dun. The Giri and the Bata join the Yamuna upstream and downstream of Paonta respectively. It leaves the territory of Himachal near Tajewala Headworks and enters the State of Haryana.

Malung is a glacial torrent in Lahaul-Spiti rising at an elevation of about 6,094 m and flows northwest to join Tsarap Lingti or Tsarap Chu which later joins the Zaskar river flowing into the Indus.

The forms of the basins of the five rivers of the Himachal and Kashmir Himalaya are unlike those of the Kumaon and Nepal Himalaya in that they are asymmetrical and oblique to the great Himalayan alignment. It is due to the fact that in the Himachal the alignments of the Lesser ranges are oblique to the Great Himalaya.

Climate

In the Himachal region, there is much diversification in climatic condition due to variation in elevation (450-6,500 m) and aspect. In general, the climate of this area is distinguished from the Punjab plains by a shorter and less severe hot weather, a somewhat higher precipitation and colder and more prolonged winter. The two main climatic characteristics of the region are the seasonal rhythm of weather and the vertical zoning. The climatic conditions vary from hot and sub-humid tropical in the southern low tracts to temperate, cold alpine and glacial in the northern and eastern high mountains. Lahaul and Spiti experience drier conditions as they are almost cut off by the high mountain ranges. The distribution of rainfall varies from less than 500 mm in greater part of Lahaul and most of Spiti to over 3,400 mm at Dharamsala (Dhauladhar range). Kulu receives about 915 mm rainfall while Jogindarnagar less than 35 km on the windward-side receives 2,327 mm. However, there is no rainless month. In all places below 900 m heat is excessive during summer. It snows during winter down to an elevation of about 1,500 m, but the snow does not lie for long below 2,500 m. At elevations of about 3,000 m, the average snowfall is about 3 m and lasts for 4 months, from December to March. Above 4,500 m there is almost perpetual snow.

Generally the region experiences low normal monthly maximum temperatures. The highest monthly maximum temperatures are experienced in June after which the temperatures continue to fall and the lowest monthly minimum temperatures are experienced in January (Fig. 9.6). Above 20°C mean marks a hot month. Mandi has as many as 7 hot months while Simla has none. Normal monthly minimum temperatures are as low as 1.9°C in January at Simla and 6.5°C at Dharamsala. Similarly the normal monthly maximum temperatures in June are 15.6°C at Simla and 22.8°C at Dharamsala. The annual range of temperature at Simla is 14.4°C and at Dharamsala 17.0°C, while at Mandi it is 18.0°C. The absolute temperatures can go down in Ja-

nuary to -4.9°C at Simla (12-1-57) and -0.5°C (21-1-60) at Dharamsala and may rise to 38.3°C (on 17-6-58) at Dharamsala and 42.7°C (18-6-58) at Mandi.

The relative humidity (Fig. 9.6) is generally higher in Himachal region than in the adjoining plains during the pre-monsoon (May-June) and monsoon period (July-August and September). After September the relative humidity sharply declines and the values are generally lower than in the plains. During winter also the values are lower and continue to remain so till April. Mandi is an exception where the humidity is generally high due to its situation on the river Beas in a more or less hill-enclosed basin.

Generally the rainfall increases from the plains to the hills according to relief and aspect. Beyond Kulu, the rainfall again decreases due to rain-shadow effect towards Lahaul, Spiti and Kinnaur (Fig. 9.6-inset). Spiti is the driest (below 50 cm) being enclosed by high mountains on all sides. About 70% of the annual rainfall is obtained during July to September; about 20% from October to March and 10% from April to June. In Lahaul and Spiti, winter and spring precipitation is greater than the summer and autumn. During winter and spring, westerly depressions bring cloudy weather and light rain and often cause heavy snowfall in the higher regions. These wet spells may be followed by cold waves. The frequency of these depressions is about two in November, four to five during December to April and again about two in May. Pre-monsoon showers occur in June and post-monsoon showers continue till the first week of October but the total amount of both is low. Highest normal monthly rainfall may take place in July or August. Dharamsala gets its maximum (1,055.3 mm) in July while Dalhousie (620.0 mm) in August.

Dharamsala is the rainiest place. In the general east-west decreasing trend of rainfall in the Himalaya, the Kangra Valley marks an exception; The exceptional heavy rainfall (Dharamsala) is due to the interplay of monsoon currents and the sudden rise (from 900m in the valley to over 3,700 m in the Dhauladhar) and particular alignment

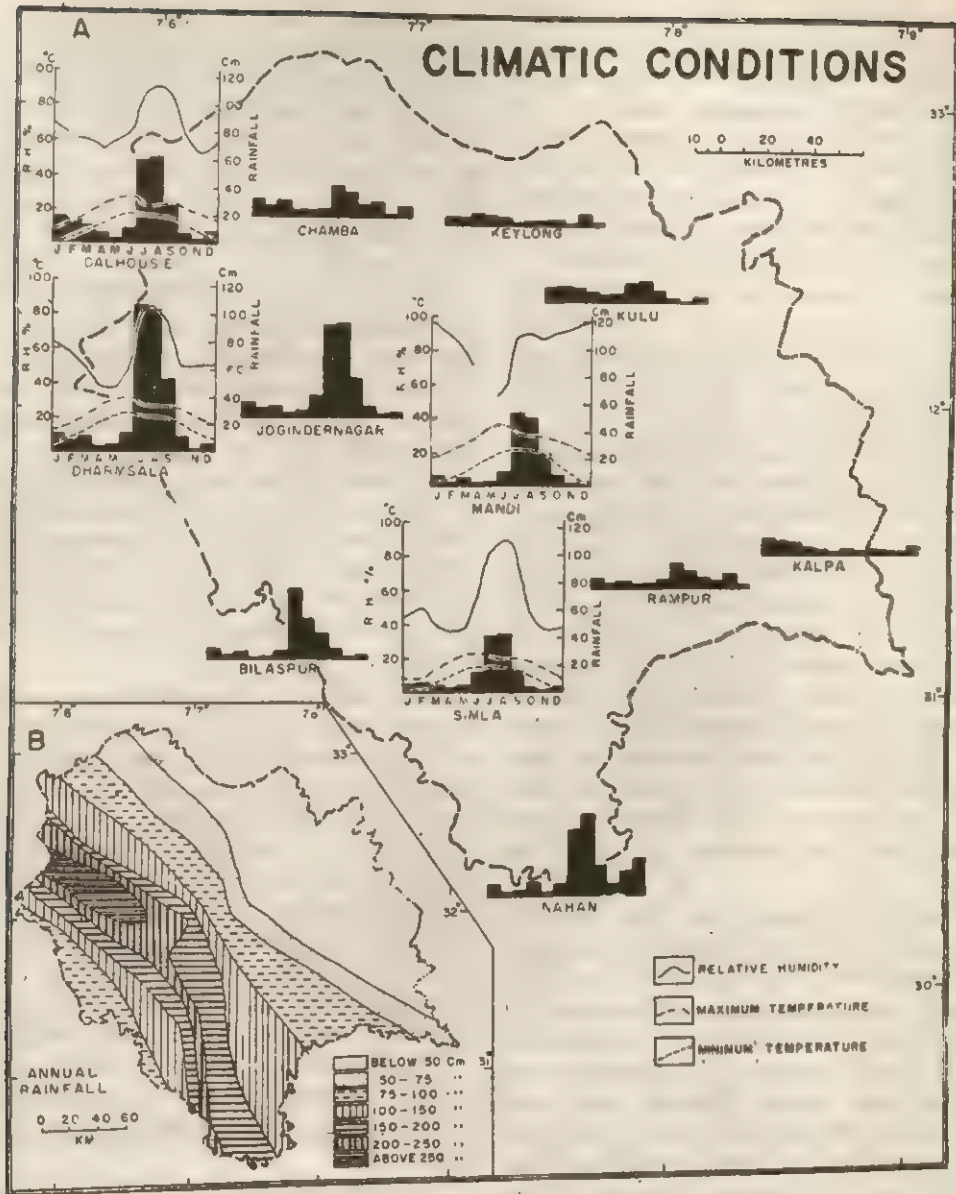


Fig. 9.0

of mountain ranges and hills.¹⁷ Simla and Nurpur lie in a rainfall zone of 1,500-2,000 mm. Dalhousie, Dharamsala, Kangra, Palampur and Jogindarnagar lie in a zone exceeding 2,000 mm but beyond this zone of maximum rainfall, there is gradual decrease towards Mandi, Rampur, Kulu, Kalpa and Keylong. Most of Lahaul and Spiti receive

less than 500 mm of precipitation. The number of rainy days vary from 48.6 at Keylong to 99.3 at Dharamsala. There is inverse correlation between rainfall and its variability. "In the comparatively rainy parts of Simla and Kangra districts the variability index is as low as 20. Where the rainfall is only 500 mm the index rises to 35.

In the parts where the rainfall is between 45" (1,125 mm) and more than 60" (1,500 mm), the variability index is less than 22.5".¹⁸ Occasional watering of crops is necessary to offset the seasonal and variable character of rainfall.

Popularly the year is divided into three seasons : (i) *Hyund* or cold season (October-February), *Taundi* or hot season (March-June) and *Barsat* or rainy season (July-September).

The Barsat : Towards the end of June or in early July, the monsoons set in. The Bay and the Arabian sea currents bring rainfall causing the temperatures to fall from 19.7°C in June to 18.3°C in July at Simla and from 27.5°C in June to 24.3°C in July at Dharamsala. However, the valley regions and lower areas are often hot and sultry. With the onset of rains, the whole panorama of landscape becomes fresh and green. The small water channels in the beds of hill streams begin to swell. Springs which had dried up during hot weather are replenished. Mosquitoes become a nuisance, especially in the paddy cultivated areas. The rainy periods are interrupted by dry breaks. July and August are the rainiest months. Damage by floods, erosion and landslips is widespread and travelling becomes often difficult. In September the rainfall decreases considerably and the skies clear up towards the last week.

The Hyund : By October the skies clear and mornings and evenings experience bracing cold. Humidity becomes low and air is dry and fine. Nights and mornings are very cold especially in the valleys due to inversion of temperature. Snowfalls usually take place in December and January although unusual falls may occur early or late. Usually snow does not lie for any length of time below 2,000 m elevation and rarely falls below 1,250 m. At elevation of about 3,000 m the average snowfall is about 3 m and lasts for about 4 months (November to February or December to March). In 1945 however, the snowfall was so heavy that places as low as Jwalamukhi (575.4 m) received snow. In 1868, nearly 1.2 m of snow fell at Kangra (about 750 m). October is a delightful month. Temperatures are not too cold and fruit is plentiful. Novem-

ber becomes definitely cold. December and January are quite cold. Light rainfall is received mainly during December, January and February due to westerly depressions. Good winter precipitation is essential for *rabi* harvests especially in the *barani* or unirrigated tracts. Winter rainfall (Oct.-Feb.) varies from about 422 mm at Dharamsala to 260 mm at Nahan, 344 mm at Kalpa and 191 mm at Keylong. Winter depressions bring in their wake snowfall and often cold waves. People seek sunshine and perform their tasks in the open as far as possible. Gaddis, the semi-nomadic shepherds who follow the seasonal rhythm descend from the mountain slopes to the valley areas.

The Taundi : The severity of winter is generally considered to be over by the end of February. Temperatures begin to rise somewhat rapidly from February onwards, e.g., Simla (February 5.8, March 10.1°C), Mandi (February 13.1, March 17.3°C) and Dharamsala (February 12.9, March 16.9°C).

The mean maximum temperatures are obtained in June when the heat becomes uncomfortable in the lower areas. The weather is hot and dusty and a fine haze hangs over the hills after mid-day obliterating the distant view. In the valley bottoms and southern low tracts people feel oppression of the heat. It is somewhat mitigated by the winds, up the valley in the day and down the mountain slopes at night. Occasional thunderstorms accompanied by light showers also bring relief. At this time of the year, snow melts and swells the hill torrents which help fill the irrigation channels or *Kubls*. In sheltered aspects, *nala* glaciers may be found as low as 3,000 m. The snow lies longer on the northern slopes.

Although there are three well-marked seasons, a brief reference to autumn and spring is necessary. Both the seasons are very delightful in the hills. The weather is cool, crisp and exhilarating during late September and October. The spring from Mid-February to March is short but lovely. The air is cool and fresh and flowers of myriad hues adorn the valleys, forest slopes and mountain meadows.

26,768 km² or about 48% of the total area. The area is classified as under :

Class of forests	Area (km ²)
1. Reserved forests	1,918
2. Demarcated protected forests	6,886
3. Undemarcated protected forests	15,823
4. Unclassed forests	868
5. Other forests	203
6. Forests not under control of Forest Deptt.	1,070
Total	26,768

National Forest Policy lays down that in hilly tracts like Himachal Pradesh, 60% of the total geographical area should be under forests.

Owing to a wide range of altitude and climatic conditions, Himachal Pradesh has a diversified and rich flora. Here we come across every type of West Himalayan Flora from Himalayan meadows and high level birch and rhododendron down to tropical scrub and bamboo forests of the low foothills. The forests cover an area of

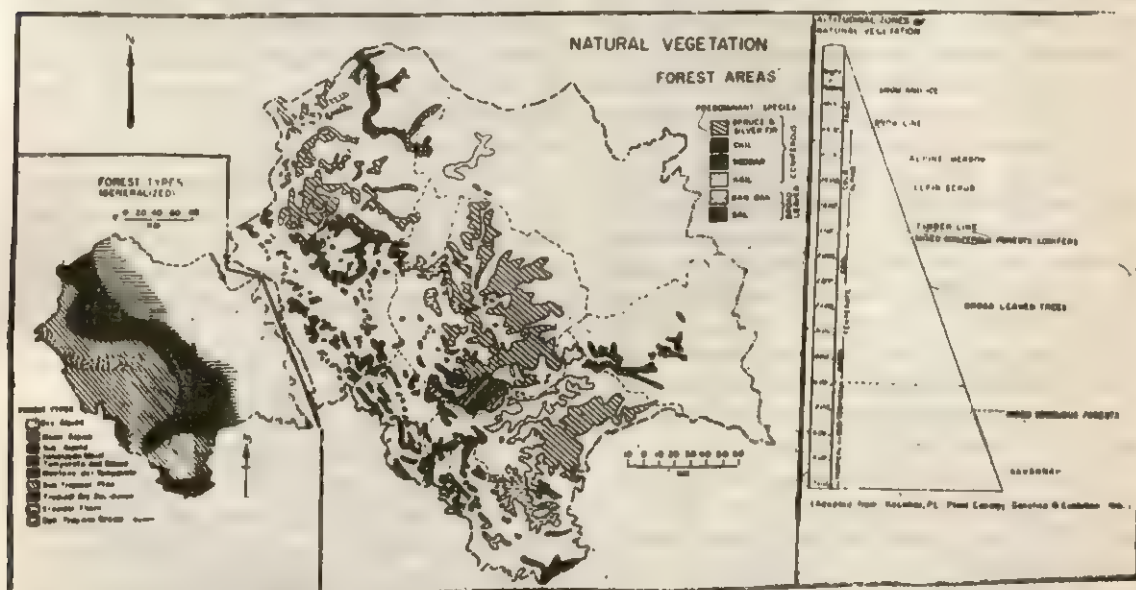


Fig. 9.7

Efforts are, therefore, being made to bring the forest area "as near to the figure laid down in our National Forest Policy as possible".¹⁶

Forests are not uniformly distributed throughout the region and are mostly confined to higher hills and interior valleys (Fig. 9.7) because in the lower and more accessible areas, the forests have been cleared to make room for cultivation and

settlement. Most of the forests belong to the government.

The natural vegetation has a climatic altitudinal zonation (Fig. 9.7—inset).

<i>Vegetation zone</i>	<i>Altitude in metres</i>
1. Tropical and sub-tropical	300—1525
2. Temperate	1525—3650
3. Alpine	3650—4650

The tree line is reached at about 3,950 m beyond which are the Himalayan meadows. The snow line is reached at about 4,600 m. On the basis of composition, the forests can be broadly classified into (a) coniferous forests, and (b) broad-leaved forests. *Chir*, *deodar*, *kail*, spruce, silver fir and *chilgoza* pine are the coniferous species. Among the broad-leaved the main species are *sal*, *ban* oak, *mohru* oak, *Kharsu* oak, walnut, maple, bird cherry, horse chestnut, poplar, alder, *semal*, *tun* and *shisham*.

The distribution of different species follows a fairly regular altitudinal stratification except where the micro-climatic changes due to the aspect and exposure and local changes in rock and soils bring in vegetation inversion, i.e., the associations which otherwise occur at higher altitudes are found projected in the lower zone and vice-versa. Generally speaking, the sequence of important timber species growing in the region is *Sal*, *Chir*, *Deodar*, *Kail*, Spruce and Silver Fir. Other broad-leaved species grow in small pockets in suitable sites.

The forests of the region can be classified mainly into nine forest types (Fig. 9.7—inset) as under :

(i) Dry Alpine forests are found in Lahaul, Kinnaur and Pangi mainly. They are very open xerophytics. Main species are juniper, artemisia, *Lonicera*, *cotoneaster* etc. Extensive alpine pastures are the characteristic feature of this forest type and support large flocks of sheep and goats during summer months and remain covered with snow from October to April or May.

(ii) Moist Alpine Scrub Forests are met with above the limit of tree growth and consist of evergreen scrub growth forming dense cover in patches broken by grass in between. Main species are, *Salix*, *Lonicera*, *Viburnum* etc. Herbaceous flora is fairly rich and medicinal herbs such as *aconite*, *dhooop* and *Karru* occur in these areas.

(iii) Sub-Alpine Forests occur above the altitude of 3,500 m and below the moist Alpine scrub zone. *Kharsu* and *Betula utilis*, the typical trees of this zone, are however, sparsely met with. High level blue pine occurs only in Kinnaur, Pangi and Lahaul divisions. Between 2,800-

3,800 m these are generally well stocked. Between 2500-4000 m occur the Himalayan Temperate Parklands which are characterized by grasslands having scattered misshapen and often moribund trees of *Kharsu* oak, maple etc. They are used as grazing grounds by the migratory herds of sheep and goats.

(iv) Himalayan Moist Temperate and Mixed Forests occupy as a whole a large area between 1,500-3,500 m. The moist *deodar* forests are the most valuable timber forests of the region. Their chief concentrations are in Chaupal, Simla, Kotgarh, Kinnaur, Suket, Nachan, Kulu, Seraj, Chamba and Churah divisions. The mixed coniferous forests include pure spruce, pure silver fir, silver fir-spruce, and spruce-*deodar* formations. These occur above *deodar* and *kail* zones between 2,000-3,500 m. The silver fir and spruce forests occur extensively in Chaupal, Pabar valley, Simla, Kotgarh, Nachan, Kulu, Seraj, Chamba and Churah divisions. Both the species are magnificent in height (50-55 m) and girth (5.5 m). The moist temperate deciduous forests occur between 2,000-3,000 m in moist depressions often along the *naals*. Horse chestnut, bird cherry, walnut, maple and poplar are main species. The upper oak-silver fir forests are met with between 3,000-3,500 m. Alder extends upto 2,250 m and colonizes unstable hill sides and moist ravines. *Kail* producing valuable timber occurs between 1,500-2,500 m mainly in Chaupal, Pabar, Simla, Kotgarh, Suket, Nachan, Mandi, Seraj, Kulu, Chamba and Kinnaur divisions. *Chilgoza* Pine forests comprise open forests mixed with *deodar*. They are commercially very important as they produce edible and costly nuts. Dry *deodar* forests occur in Kinnaur and Pangi divisions. Montane bamboo brakes occur as undergrowth in *ban*-oak and spruce-silver firs.

(v) Wet Temperate Forests are chiefly confined to wet slopes of Dalhousie, Dharamsala, Kangra, and Palampur area and include various temperate species.

(vi) Sub-Tropical Pine Forests : *Chil-pine* is the main species which occurs between 1,000-2,200 m. Both lower or Siwalik *chil-pine* and upper or Himalayan *chil-pine* are met with in Suket,

Chamba, Nahan, Mandi, Kotgarh, Simla, Chaulpal, Pathankot, Kangra, Beas and Hoshiarpur divisions.

(vii) Sub-Tropical Broad Leaved Hill Forests stretch east to west from Mandi along the Beas (below 1200 m). Great damage has been done to these forests by grazing and excessive lopping, which have been reduced at places to scrub.

(viii) Northern Tropical Dry Deciduous Forests occur up to 1,250 m in the lower hills extending in the interior valleys along the rivers. Sal is the main species largely found in Nahan and Bharwain range of Hoshiarpur division.

(ix) Tropical Thorn Forests occupy a small area of Nalagarh and Pachhad tahsils.

The forests of the region are of great importance for its economy as well as for maintaining the ecological balance of soil, water, fauna and flora. Unfortunately damage to natural vegetation has been large and widespread. Due to increasing requirements of wood and timber, fellings have been excessive. There has been extension of terraced cultivation and *nanor* in forest areas. In addition to growing pressure of human population, the incidence of grazing is high. Glover²¹ estimated a grazing incidence

of 1.25 per acre while according to another estimate²² it is 2.50. Forest fires do great harm. Deforestation has led to micro-climatic changes, loss of wild life, landslips causing loss to property and communications, erosion, lowering of sub-soil water and irregular river regimes, and deposition and silting—all have ultimately brought about numerous hardships and even ruin. It is said that the decline of Roman empire is a story of deforestation, soil-exhaustion and soil erosion.²³ Therefore our forest policy should aim at the development and conservation of forests of the Region where they constitute one of main natural and economic assets.

Soils

The soils of the region vary according to aspect, altitude and climate. On the whole, the soils are young and thin and any depth in them whatever, occurs in the valleys or on gently inclined hill slopes. Owing to rugged topography, the profiles are channery and have diffuse boundaries between the genetic horizons, thus indicating their skeletal character. The agriculture department of Himachal has classified the soils into five types (Fig. 9.8-A) taking into consideration climate and altitude.²⁴

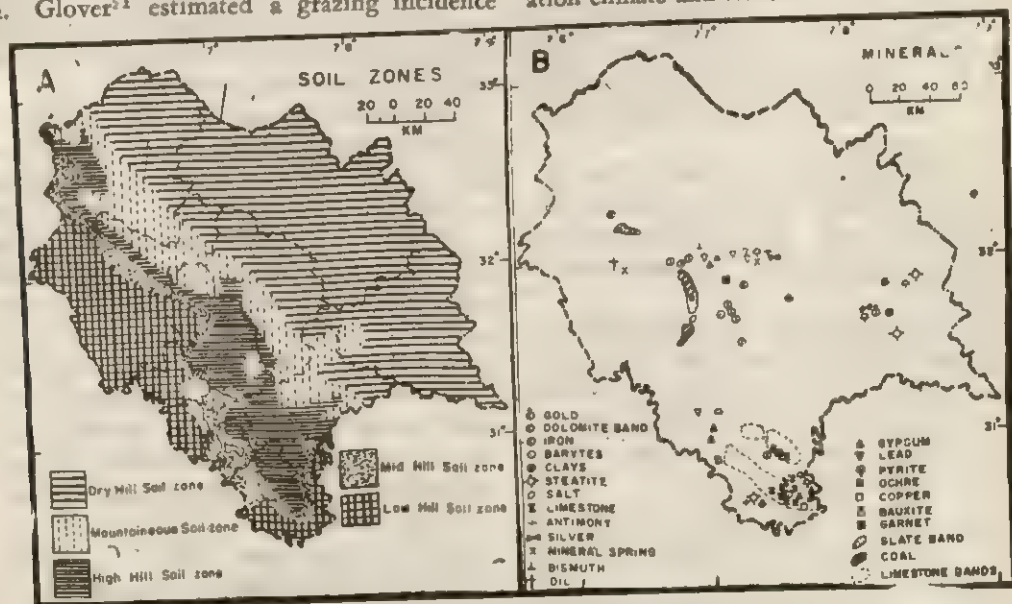


Fig. 9.8

(1) Low Hill Soil Zone extends upto an elevation of 900 m. The soils are shallow and embedded with stones. Soil reaction is almost neutral; carbon-nitrogen ratio is 10 : 1. Available nutrient status varies from low to medium.

(2) Mid-Hill Soil Zone extends between 900-1,500 m. The soils are loam to clay-loam in texture with greyish-brown colour and are well drained. C/N ratio varies between 10 to 12. These soils are neutral to slightly acidic in reaction. Available nitrogen and phosphate are medium whereas available potash varies from low to medium.

(3) High Hill Soil Zone : These soils extend between 1,500-2,100 m and have developed on steep slopes with good drainage. Soil texture ranges from silty-loam to clay-loam with dark brown colour. In favourable aspects, the soils are quite deep. The organic matter is also high. Available nitrogen varies from medium to high whereas potash is medium. Available phosphorus is low to medium. Soil reaction is acidic to neutral.

(4) Mountainous Soil Zone extends between 2,100-3,000 m. These soils are shallower in depth than the high hill soils. Soil texture is silty loam to loam, with dark brown to light brown colour. Soil reaction is slightly to moderately acidic. Organic content varies from 2.5 to 3.5. Available nutrient status is medium to high. These soils are not very much used for agricultural purposes.

(5) Dry Hill Soil Zone : These soils are found in Lahaul and Spiti, Pangi and Kinnaur where mon-soonal rainfall is small. These are high textured soils with a variable fertility. Organic status is almost low.

However, people take a utilitarian view of soils, distinguishing between lands lying close to or at a distance from the homestead and between lands that yield one or two crops. Middleton in his final report on Land Revenue Settlement³⁵ has classified soils as under :

1. *Chaib*—Irrigated from wells.
2. *Nehri I*—Land irrigated from perennial source.
3. *Nehri II*—Land receiving water from non-perennial source or only at times.

4. *Nad*—Inundated land only growing rice crop.
5. *Dofasli* unirrigated—Bearing two crops a year or three in two years.
6. *Ek fasli* (unirrigated)—Bearing one crop a year.
7. *Bahnd Banjar*—Bearing a crop once in 2-3 years.
8. *Kharetar*—Hay field.

Minerals

The potential of mineral wealth is believed to be considerable but it still awaits investigation. According to the preliminary investigation of the Geological Survey of India, the mineral occurrences in Himachal Pradesh are salt, gypsum, limestone, barytes, clays, mica, iron pyrites, slate and lead, but of these salt and slate alone are of some significance.³⁶ The distribution of minerals is uneven (Fig. 9.8-B). Mandi accounts for entire output of salt and considerable output of slates. Himachal has the only rock-salt deposits in India. Mandi salt deposits were first located in 1841 and extend from Megal to Guma. Rock salt is excavated at Drang and Guma. The reserves are estimated at about 3.00 million tons and the annual output is 48,516 quintals. Nearly 1/3 of the production is exported to other areas. Salt mining should be modernized to make it more efficient and less wasteful.

There are considerable deposits of slate. Slate mining is carried on in Mandi, Chamba and Kangra. The slate of Himachal is useful only for roofing purposes.

Limestone is found extensively in Bilaspur, Sirmur and Kangra districts of which particularly important are Sataun deposits of Sirmur (reserves est. 141 mill. tons). Himachal gypsum is of low grade. The deposits are at Rajban (1 million tons), Bharli (235,000 tons), and are also reported from Lahaul-Spiti area and Subathu. Barytes of good quality are found in interior hill ranges and in Sirmur. There are deposits of iron ore in Mandi and Kangra. Mandi deposits are estimated at 60 mill. tons. Lack of transport and fuel limits exploitation. Building stone is found extensively. Some of the ancient forts are a testimony to the fine quality of stone and

workmanship of the artisans. Traces of anti-mony, asbestos, bismuth, cobalt, nickel, copper, glass sand and china clay have been found in Himaahal but their workable deposits have yet to be determined. At Jwalamukhi temple jets of combustible gas have attracted people since long. In Kangra and Hoshiarpur area five wells were sunk by oil and Natural Gas Commission. So far only gas has been found, though not in commercial quantities. The production of minerals at present is reported to be 37,743 tonnes and the production at the end of IV Plan (1969-74) would be 450,000 tonnes.¹⁷

Numerous mineral and thermal springs occur in Himachal, some of which also have therapeutic value. These springs occur in Tatwani, Loonsu, Manikaran, Kalath, Bashist, Khirganga and a number of places in Lahaul and Spiti.

Physical Resource Base

Himachal region has a large and varied physical resource base. Its hills and dales, forests and rivers and soils and minerals constitute the chief resource. This physical diversity coupled with fine climate has high economic value for tourist industry. The valleys of Kangra, Kulu and Chamba and the hill stations of Simla, Dalhousie, Dharamsala and Manali are visited by tourists from all over the country. No scenery in the opinion of Banon²⁸ "presents such sublime splendour." In the absence of any large-scale industries and with subsistence agriculture, tourism provides a major resource. Fortunately tourism also increases and encourages the conservation of natural resources.

Covering nearly 48% of the total area of the region, forests form an important source of income, providing raw material for industries, fodder and nutritious grasses for the livestock and several materials for the needs of the agriculturists and other people. They are also a valuable source of herbs and drugs. Forests are the habitat of a rich fauna and also provide game.

The region has a variety of soils favouring several crops. Some soil zones are particularly suited to horticulture and production of tea,

ginger and potatoes. The mineral deposits of salt, slates, limestone and gypsum are available in commercially exploitable quantities. They are being already exploited but with proper planning they can be utilized for industrial development.

The rivers and streams have plenty of fish. Mahseer is common in most waters and trout is found in Uhl, Beas and many other streams. With proper management, fish could be a valuable source of food in this food deficit region.

Himachal Pradesh has vast potentialities for the generation of hydel power with estimated potential at 8.5 million kw which can be a source of income as well as economic development.

The Cultural Setting

Population

Himachal with an area of 56,019.3 km² and a population of 2,812,463 (1961) has an average density of 50 persons per km². Most of the population is confined to valleys and lower slopes of the hills and mountains.

Population Growth: The population of Himachal increased from 1.70 million in 1901 to 2.81 million in 1961 giving an increase of 65.2%. The causes of overall slow growth are the difficulties of terrain and lack of economic opportunities. Also the availability of medical, health and sanitation facilities is restricted only to open and accessible places.

The decennial growth (Fig. 9.9) shows a gentle curve up to 1931 but with a slight decrease in 1911 due to natural calamities such as Kangra earthquake (1905), epidemics etc. Since 1931 the curve becomes steeper but the maximum decennial variation is 11.18% in 1931-41 and is only 7.02 during 1941-51. The construction of Kangra Valley railway, completion of Mandi hydroelectric project, improvement in road transport and the influx of displaced persons contributed to this increased rate of growth. Between 1951-61, there has been a steep growth. This is mainly due to further improvement in communications and commerce leading to greater influx of people from the plains, increased medical facilities, decreased mortality, development of irrigational

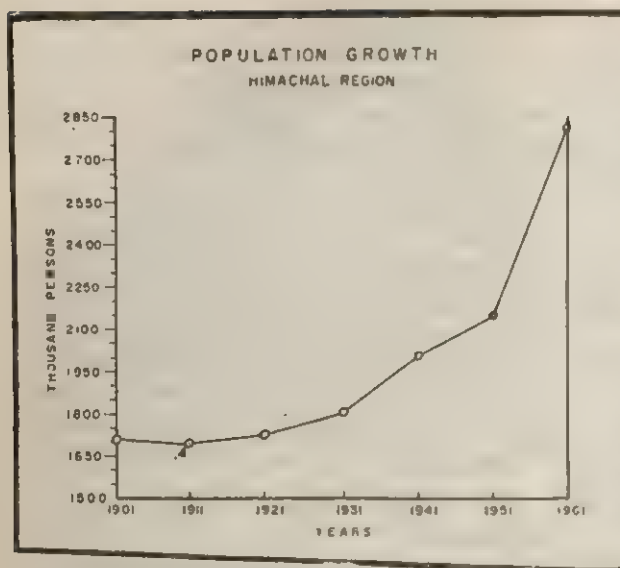


Fig. 9.9

facilities, increased electrification, influx of Tibetan population and better enumeration of population. Lahaul and Spiti district and parts of Chamba, Mahasu and Kalpa districts were made more accessible due to policy of border roads construction. Simla district experienced lowest increase of 24.1% during 1901-61 (Fig. 9. 10-B) because Government of Punjab and Government of India stopped the practice of shifting summer capital to Simla. This was a great set back in everyway and a once highly populated town and environs became a shadow of its former self. Kangra, Kulu and Sirmur had an increase of 25-50% while Chamba, Mandi, Bilaspur, Mahasu and Kinnaur experienced an increase ranging from 30-75%.

The region's growth rate (30.85%) for

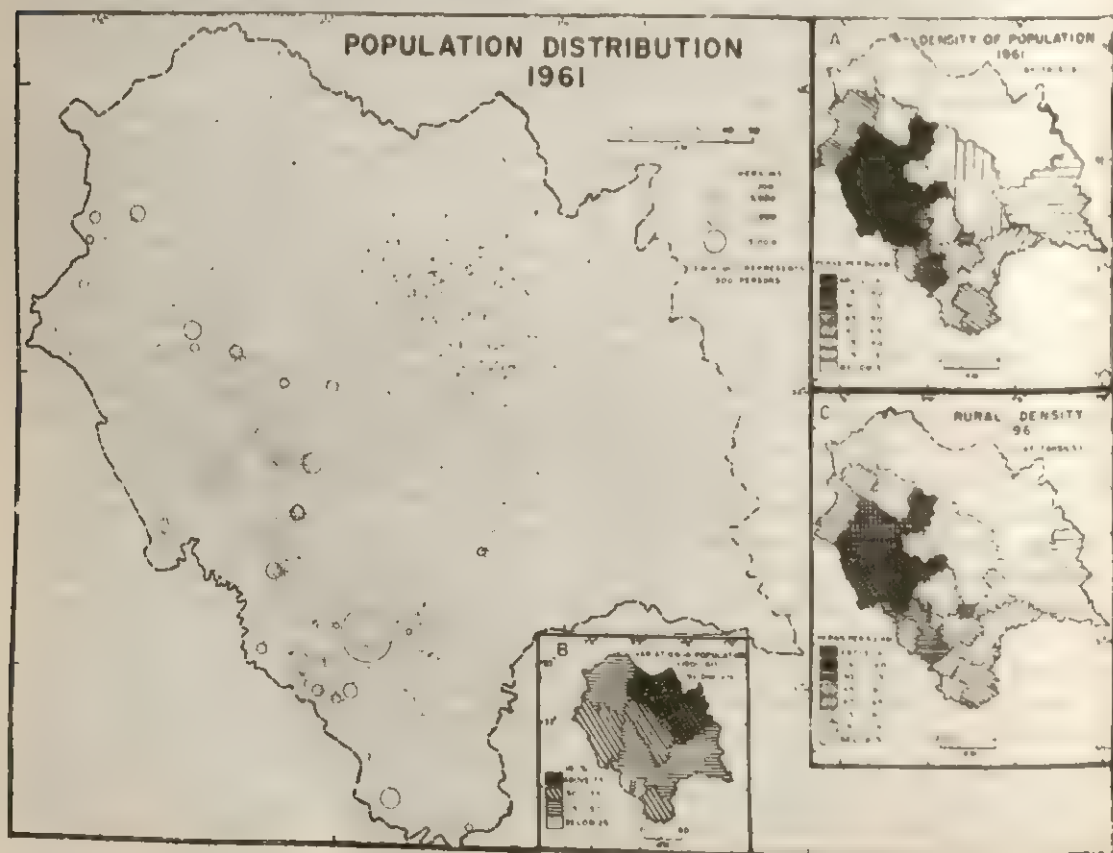


Fig. 9.10

1951-61 is much higher than the National average (21.50) which means that the population will double before the end of the century.

Distribution and Density of Population : There is distinct clustering of population in valleys (Fig. 9.10). Areas of harsh climate and steep inclines are thinly populated. The high and rugged mountain ranges with snow-capped pinnacles and forest-clad slopes are practically empty. Areas

like Kangra, Kulu, Suketi and lower Sutlej and Ravi valleys and Kiarda and Jaswan duns are densely populated. The broken hill country to the south is generally sparsely populated. The valley areas have fertile soil and good irrigational facilities and therefore contain the highest concentration of population. "Like mineral veins in a rock, valleys are rich in population element"²⁹. The Beas basin carries the highest concentration

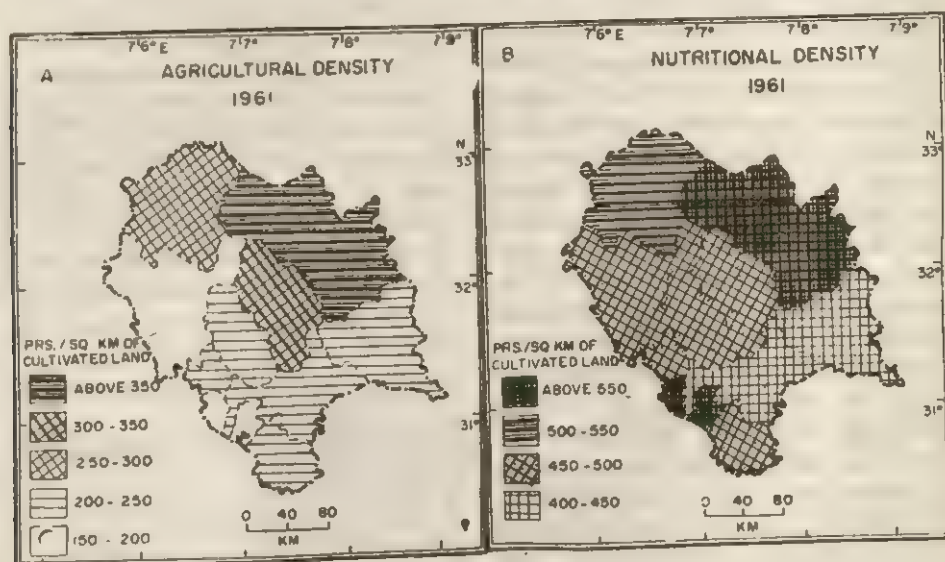


Fig. 9.11

of population as it has the most extensive area of agricultural land. In general the area between lower Sutlej and the Kangra valley has a greater concentration because of larger areas of comparatively level terrain for agriculture and better means of transportation. The area as a whole is also economically more developed. In the rest of the area, the population is scattered in limited tracts of forest clearings, along rivers and roads and near the towns.

The trans-Himalayan tracts of Kinnaur, Lahaul and Spiti carry very little population as they are semi-arid highland zones.

Density Patterns : The general density, rural density, agricultural density and the nutritional density maps (Fig. 9.10-A, &C and 9.11-A, & B) reflect distinct patterns.

TABLE 2

Density patterns per km² (1961)

District	General density	Rural density	Agricultural density	Nutritional density
Simla	137	92.0	150.7	618.1
Kulu	16	15.2	315.8	480.1
Kangra	143	135.5	196.6	497.9
Lahaul & Spiti	2	2.1	408.7	842.3
Chamba	32	29.3	284.3	535.4
Mandi	92	86.5	235.7	455.1
Bilaspur	137	130.2	225.9	531.3
Mahasu	61	59.4	233.0	425.7
Sirmur	67	62.0	222.6	463.0
Kinnaur	6	6.1	213.3	447.8

High general densities ranging from 90-143 per km² occur only in greater parts of Kangra, Mandi, Simla and Bilaspur, which have extensive agricultural areas with irrigational facilities, more developed transport and trade. Kinnaur, Lahaul and Spiti have low density (below 15) being the least developed, remote trans-Himalayan tracts. Kulu and greater part of Chamba are mountainous and have large forest areas and densities generally range from 15 to 40.

Rural density patterns (Fig. 9.10-C) are more or less the same as that of general density, about 94% of the people being rural. That the region is remarkably well populated is evident from the high figures of agricultural density ranging from 150-408. Lahaul and Spiti where agricultural land is highly restricted shows the highest agricultural density (408.7) (Fig. 9.11-A) while the general density is only 2. Elsewhere too, densities are especially high where agricultural land is less due to various physical and climatic factors. On the contrary, in Kangra and Simla the densities are not as high due to extensive arable area in the former and small agricultural population in the latter. In general, agricultural density increases from south to north and north-east as conditions of climate and terrain become more rigorous restricting agricultural area. The pressure on cultivated land per km² is still further increased if the whole population which looks for the produce of the land, is taken into account (Fig. 9.11-B). The average for the whole region increases to 428 persons per km² of cultivated area. Lahaul and Spiti for reasons accounted earlier tops the figure with a density of 842.3. With low precarious rainfall and low yields the crowding leads to almost wretched condition. Densities are also high in mountainous Chamba.

Rural-Urban Population : 93.66% of the population is rural and only 6.34% is urban. Simla district has the lowest rural population (67.28%) owing to the urban population of Simla (42,597). Lahaul and Spiti and Kinnaur have 100% rural population (Fig. 9. 12-A).

Sex Ratio : There are only 938 females per 1000 males as compared to 941 for India as a whole.³⁰ Polyandrous Lahaul and Spiti has the

lowest ratio (776), while Mandi has the highest sex ratio (994). The sex ratio has marked an increase from 885 in 1901 to 923 in 1961.

TABLE 3

Sex ratio by years for Himachal region

Year	Sex Ratio	Year	Sex Ratio
1901	885	1941	897
1911	904	1951	915
1921	902	1961	923
1931	906		

Literacy : The percentage of literacy has increased from 7.7% in 1951 to 17.1% in 1961, and after the merger of new areas in 1966, it comes to 21.2%. This is less than the national average (24%). This is partly responsible for the relative backwardness of the region. For, of all the resources, the resource of knowledge

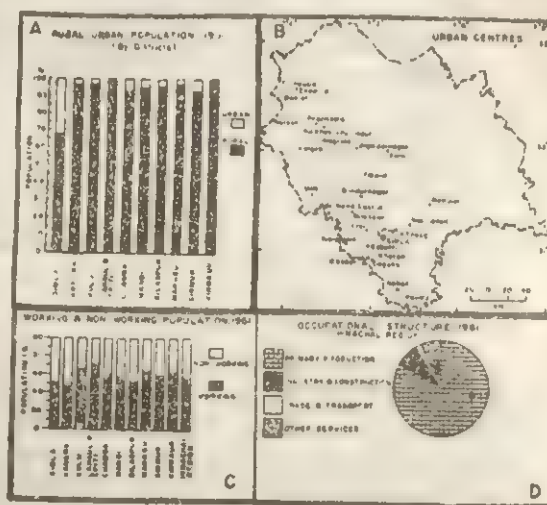


Fig. 9.12

is indeed the most important. Only Kangra and Simla have a higher percentage (above 25); in all the other districts the percentage is below 20.

It is, however, encouraging to note that facilities for education and technical training have been increasing during each Plan period and Himachal now (1970) has a University of its own.

Occupational Structure : Slightly more than half of the total population of Himachal (55.2%) is employed in various occupations, which is rather

a high proportion. The percentage of workers varies from 70.2 in Lahaul and Spiti to 47.6 in Kangra (Fig. 9.12-C).

Agriculture and other primary production like forestry, fishing, gardening, hunting, mining etc. engage the majority of the workers (83.4%) (Fig. 9.12-D). Other occupations show a meagre percentage (16.6). This is mainly due to the fact that economically the area is underdeveloped and secondary and tertiary sectors are little developed. However, the ratio of working force to total population is nowhere so high as in Himachal Pradesh. Next to primary production is industry and commerce employing only 7.9% of the population in crafts, small scale industries and a few medium-sized factories. Other services occupy 6.9%. The weakest sector is trade and transport which provides employment to 1.8% of the population. Simla is the capital district where miscellaneous job opportunities exist and it has trade, transport and some secondary development. Otherwise, in most of the

districts 80% or more population is engaged in primary production (Fig. 9.13). In trans-Himalayan districts of Lahaul and Spiti and Kinnaur due to less favourable agricultural conditions 70.2 and 62.2% population is employed in primary production. In the long winter and when otherwise idle, the people engage themselves in craft industries.

Human Resource : The region is inhabited by numerous hill peoples and tribes who lead simple lives in the lap of nature. It is stated that Himachal has been granted Statehood not 'because of the size of population, nor because of its area but because of the need to preserve the distinctive cultural entity of its people'.³¹ The people of the hills differ from those of the adjoining plains, linguistically, culturally and economically and they could not develop their potential personalities and standard of living unless their genius was allowed full play. The Himachalis are essentially peace-loving and hardworking people. The percentage of workers (55.2) is amongst

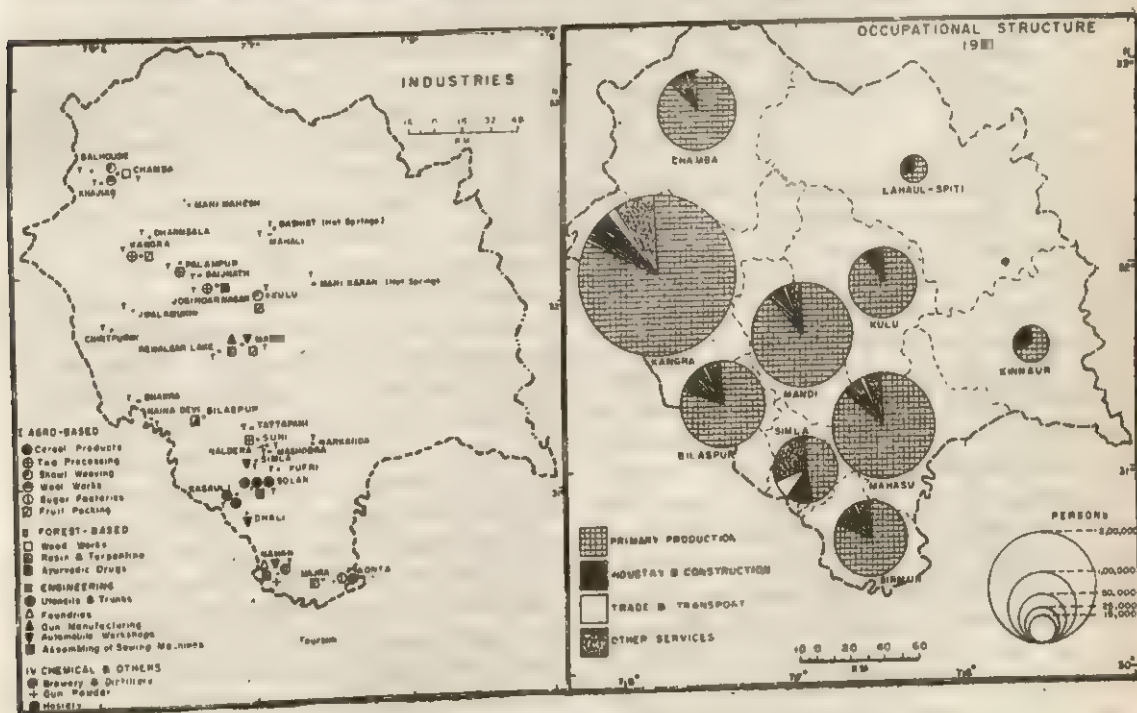


Fig. 9.13

the highest in India. Literacy is low (21.2%) and more education and training will increase the efficiency and production potential of the people. The high percentage of workers is due to the participation of women. A healthy community is a basic condition for improvement in any economic and social sphere of development. For as Whipple³² puts it "A nation's true wealth lies not in its lands and waters nor in its forests and mines, nor in its flocks, nor in its dollars, but in its healthy, happy men, women and children." Welfare extension projects have been provided Rs. 9.81 million in IV Plan. Backward tribal population which are particularly concentrated in more inaccessible areas like Chamba, Kulu, Kinnaur and Lahaul and Spiti have not received adequate attention so far. It is necessary to realize that these border people must be educated and uplifted so that they may play a healthy role in the maintenance of the strategic border areas. They must have a sense of belonging; fortunately Himachal has a stock of people, popularly known as 'Dogras' with long traditions of valour in fighting, who have distinguished themselves in the defence of motherland.

Rural Settlements

Most of the population resides in 12,690 rural habitations varying in size from isolated hamlets to agglomerated settlements. The average population per village is about 208 in Himachal and varies from 1,475 in Kangra to 57 in Simla.³³ The wide, fertile and well-watered area of Kangra provides conditions for growth of larger settlements while the hilly Simla tract restricts the size. In the dry and high Lahaul and Spiti, settlements are restricted to a few favourable areas and the average size of the village is about 1,000. Physical conditions and availability of agricultural land appear to be the main factors in the distribution of settlements. In the hills the compact habitations like those of the Punjab Plains are not met with. They are replaced by smaller and much less compact units. Generally three main types of settlements may be distinguished (Fig. 9.14-A): (i) semi-sprinkled, fragmented or ham-

leted type (ii) sprinkled or dispersed type and (iii) isolated homesteads.

There is often a striking absence of a common village site. Himalayan zone is perhaps the only extensive area of true dispersal of the type found in European highlands. For revenue purposes small areas are grouped into fiscal units called *manzas*. Semi-sprinkled or hamleted type is met with in the lowlying valley areas where there are continuous stretches of fairly level land. "Similar conditions of soil, hydrography and climate tend to make given type of settlement dominant on account of necessity of living together in harmony."³⁴ Moreover, intensive use of land, collective management of water and a common agricultural routine have led to the growth of small hamlets or semi-sprinkled habitations. Rice culture here too demands cooperation along several lines as also in Middle Ganga valley³⁵ and other rice-growing tracts. Other interesting examples of semi-sprinkled habitations are found in river valleys and on spur tops. In Kulu, the hamlets are strung in an arterial pattern on both sides of the Beas (Fig. 9.14-B). Spur tops sometimes provide sufficiently broad and fairly level surface as may be observed on the spur descending southwards from Dharamsala (Fig. 9.15). Sprinkled or dispersed habitations have developed where the agricultural land is divided in patches as a result of dissection of relief and soil. Such is the case in southern hill country and in the lower mountainous slopes. The fields are small and scattered and peasants generally live on the farmsteads to take greater care of land and protect their crops from the depredation of wild animals. Isolated homesteads are found in the higher mountainous tracts (Fig. 9.15). Above 1,800 m elevation, the habitations consist mainly of isolated homesteads. Tiny dispersed patches of terraced land do not provide sustenance for more than a few persons. People combine pastoralism with farming. Chakli Got above Kareri is situated at an elevation of 2,900 m and some homesteads of the Gaddis may be observed even above 3,350 m. Out of the varying conditions of habitat have developed different types of habitations.

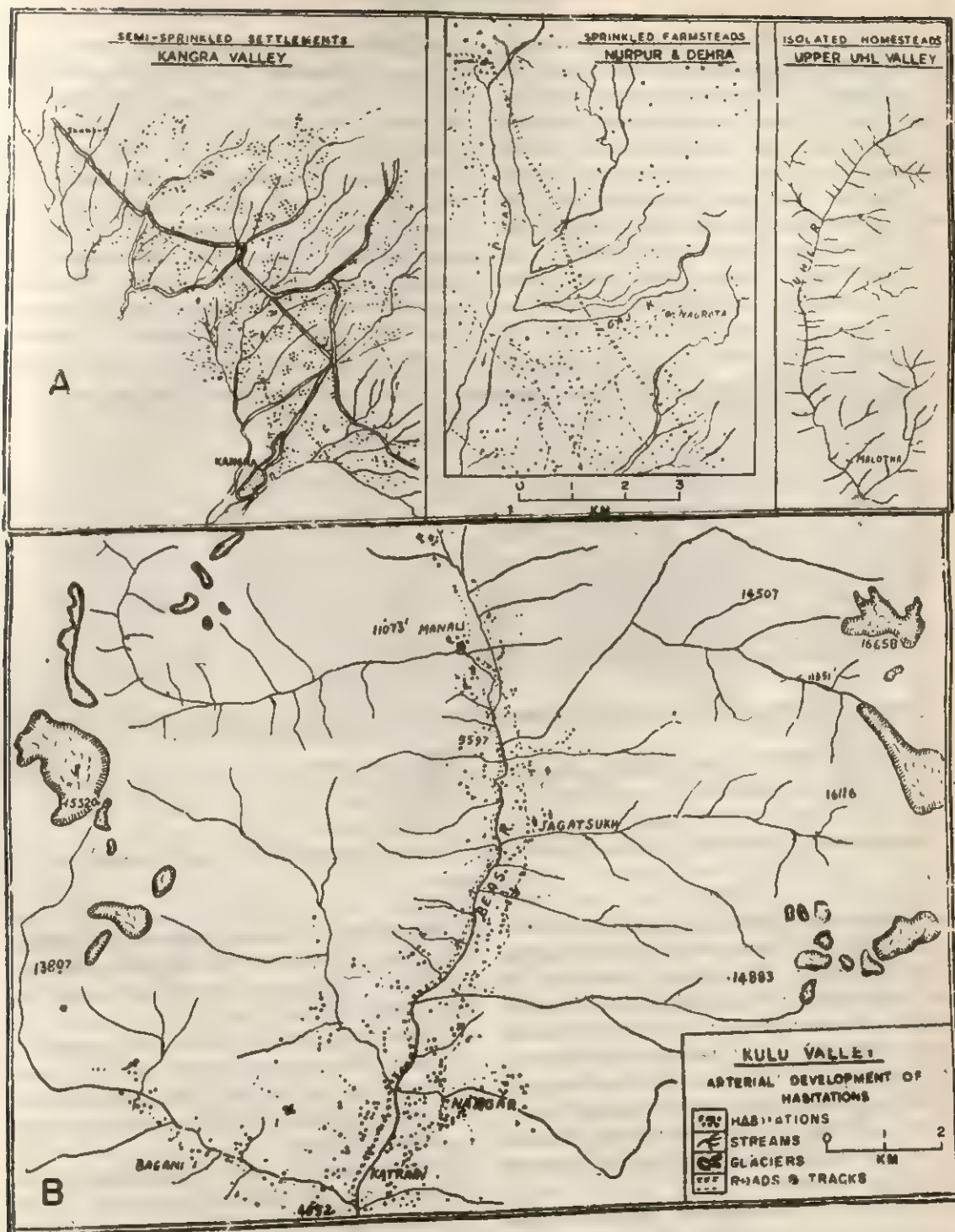


Fig. 9.14

Hill Village or Hamlets: Himachal villages or *Tikas* as they are generally known, have picturesque settings. Villages are situated in valleys, terraces or spur tops at suitable sites that are free from high winds, or landslips, and near a source of water. Hill routes, religious centres etc., may be other points of advantage. The site is usually unsuitable for other uses. In the valleys there are groups of houses amidst the thickets of trees. A small water channel or *Kuhl* runs nearby. Adjoining each house is a small garden or *Labri* where vegetables and some spices are grown. Water for drinking is ob-

tained from nearby spring but where springs or wells are not available *Kuhl* or stream water is used. In higher hills dwelling sites occur at safe spots that are open to the sun and command a view of the fields. Houses are often grouped without any plan; arrangement depends on the nature of the ground on which they stand. The general aspect is, however, pleasing. The spur top or high hill habitations have to be approached by a long flight of stone-made steps: "It is no exaggeration that to visit every house in Kangra postal village would take one full day."³⁶ Except at cross roads, where a few shops-cum-houses

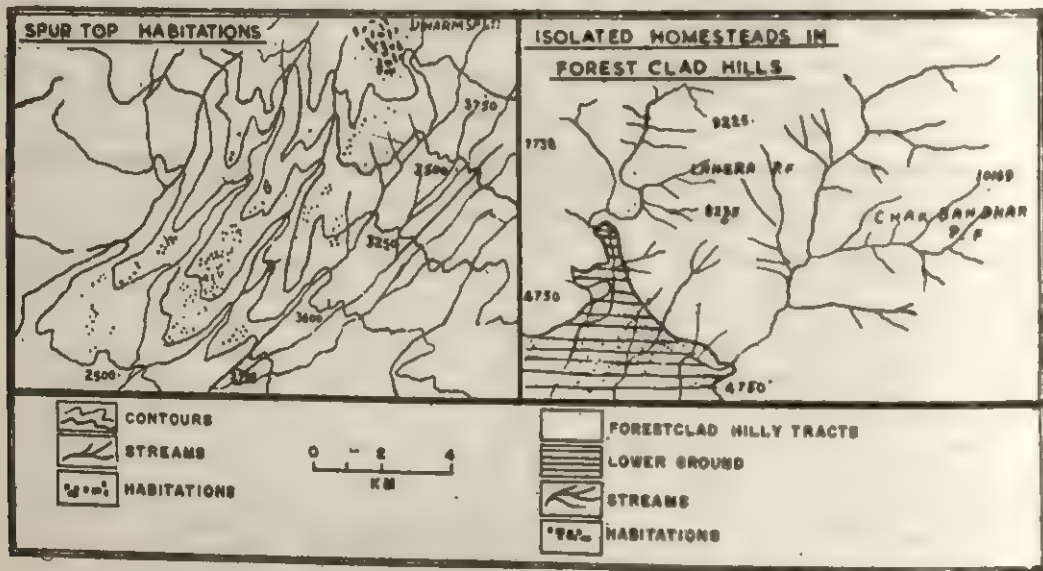


Fig. 9.15

are located, all other houses are widely separated. Caste differentiations are also expressed in settlement groupings. The menial castes live on the outer margins. The higher sites are often inhabited by the higher caste, with some exceptions. The isolation of villages due to lack of adequate means of transport and communications makes the village-folk conservative. There is little social coherence due to scattering of houses and caste restrictions. This situation however is gradually improving.

Rural House: Rural houses are simple structures providing for the sheltering of peasant and

his family and for storing grain and implements etc. They are generally built of locally available materials. Three main types of houses may be distinguished (Fig. 9.16).

- (i) **Nurpur House**—In the outer hills where the rainfall is less, houses are made of mud and/or stone and have flat roofs. Such houses are found in Nurpur, Una and other outer hill tracts.
- (ii) **Kangra House**: In the valleys and higher up where the rainfall is more, the houses have pitched roofs. The plinth is made of stone and the walls are of *kaccha* or *pucca*

bricks. Where building stone is abundant, the walls may be of stone with thatch or slate covering. House are built on site open to the sun and sheltered from wind.

- (iii) Kulu House : In the high mountainous tracts, where level land for construction of houses is restricted, houses become taller. The houses are made of stone and timber. Where suitable stone is not available houses may be built entirely of wood. The ground floor is used as cattleshed. The first floor

is used as store and the second floor is used for living and cooking. The Kulu type is subject to numerous local variations.

All the houses have compounds or *Angans* either singly or jointly which are used for ricehusking, as threshing floors and for various domestic purposes. Each year in the season of *Navratras*, the houses are plastered or painted, cleaned and adorned. Rural electrification, wherever available, is improving living conditions in rural habitations.

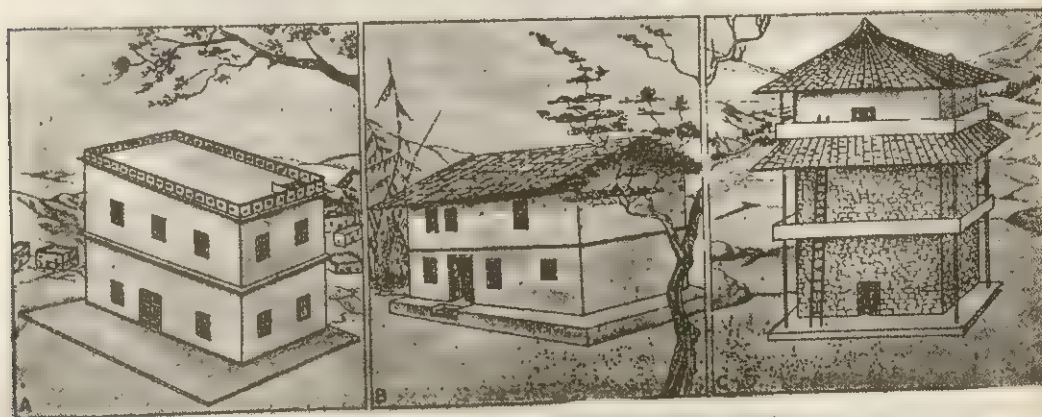


Fig. 9.16: Himachal House Types : A. Nurpur House, B. Kangra House, C. Kulu House.

Daslatpur (Fig. 9.17-A), a typical Kangra village, is situated 4 km south of Kangra at approximate elevation of 636 m on gently sloping land along Dharamsala-Hoshiarpur road. It is a rural central place in its embryonic stage. The village occupies a small area of about 8.1 hectares. Although it lies in the unirrigated tract, yet on account of winter rainfall, the land is double-cropped. Rice and maize are important kharif crops occupying about 68.8% of the sown area. Wheat, gram and barley are grown during rabi with moderate yields. Majority of the holdings are small and uneconomic. It is a village of Ghirths, the agriculturists. 92% of total population (1474) is engaged in agriculture; Only 23 persons are in commerce, 17 in transport and 40 in other services. The rests are *Sunars*, *Khatris* and some *Harijans*. The Ghirth society is polygamous as women are active participants in agricultural

work; this is now on the decline.

The peasants live in mud-brick and thatch or slate-roofed houses which are two-storeyed, and have three or four rooms which serve as living room, side-room, store and kitchen. There is a small compound in front of the house and in one corner is the cattleshed. Around the compound is a thicket of trees and brambles which affords privacy, fuel and fodder. Adjoining the house is a kitchen garden. The houses are scattered in small groups near the farms. There is a small bazar with half a dozen shops along the road. Shopkeepers also own land. There is a primary school, young farmers' club, an adult literacy centre and a women's sewing centre. They may form the nucleus of a healthy literate farming community if these social institutions are fully developed. Income from agriculture is not enough and peasants supplement

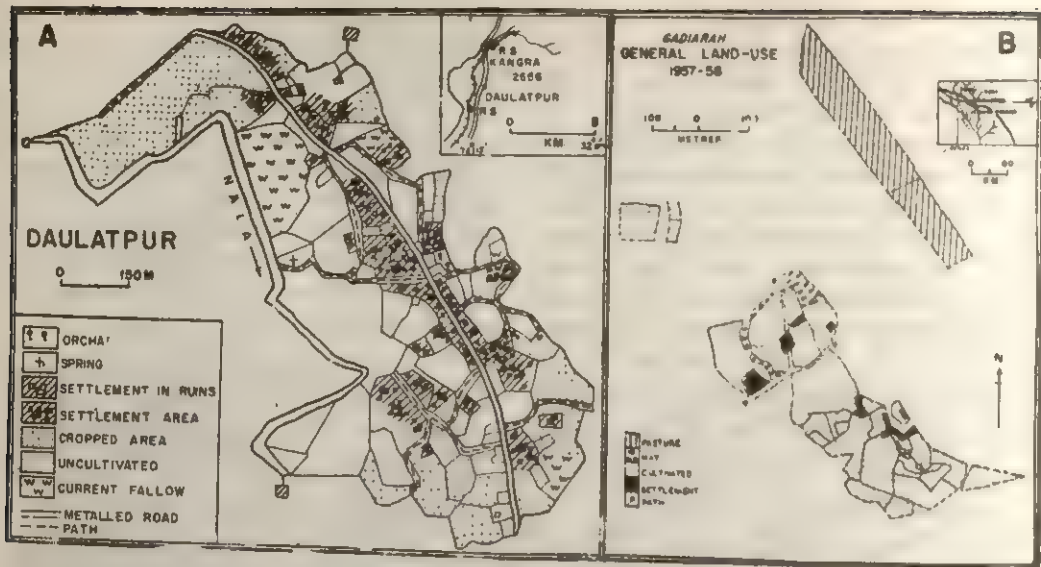


Fig. 9.17

their income by selling fuel and milk and by extra labour outside. *Gadiarah* (Fig. 9.17-B) lying at an approximate elevation of 1,350 m at a distance of $1\frac{1}{2}$ km from Jogindarnagar is a typical Mandi village. The tributaries of Rana Khad seam village hill-sides making deep passages. Land for agriculture and settlement is highly limited, the village covering only 14.5 hectares. There is no irrigation but the area is mostly double-cropped (91%) due to adequate summer and winter rainfall. Soils are thin and stony. They are low in pH value and have a tendency towards acidity. The fields are terraced. There are natural pastures in the north-east and some of the land is also reserved for hay fields.

Agriculture and livestock provide the main means of livelihood. Cultivated area comprises 61.11% of the total, hay-fields and pastures occupy 33.34% and the rest is under settlements, etc. The fields range in size from 0.01 acre to 3.7 acres. The holdings are uneconomic and people supplement their income by sale of milk, firewood, and wages earned through labour and services outside. *Batebras* combine agriculture with masonry work, *Rajputs* combine it with service and *Gujjars* combine it with dairying. Keeping of livestock is facilitated by the availa-

bility of pastures and hayfields. "The farmer really depends on manure rather than on rotation for successful harvests".⁸⁷

Maize is the most important crop during *Kharif* occupying 72.7% of the cultivated *kharif* area. Rice, Kodra and pulses are also grown. During *Rabi* wheat occupies 72.8% of the cultivated area; barley, oilseeds, and pulses occupy barely over a hectare.

Of the total population (80), 33% are Gujjars. They sell milk in nearby Jogindarnagar. The houses are arranged in small groups with Rajputs to the left, Gujjars in the middle and the Batebras to the right. Houses are built of stone and clay bricks and are covered with thatch or slate. Each house has 3-4 rooms. Cattle are kept in separate sheds. The village people worship a hill deity known as 'Baba Deot Sidh'. Due to the facility of education at Jogindarnagar some boys from the village have matriculated and a few have joined service. Education and contact with townfolk are widening the outlook and decreasing social taboos.

Urban Settlement

There are only 29 towns, mostly small ones. Of these 1 is in class III, 4 in class IV, 8 in Class V

and 16 in class VI. The smallest town is Nainadevi with a population of only 328 and the largest is Simla with 42,597 persons (Fig. 9.10 and 9.12-B).

Chamba is highly congested town having 3,670 persons per km², while Narkanda has only 280 persons per km². The total population (38,781) of 16 Class VI towns is less than the population of Simla. Urban population forms only 6.34% of the total population. Urbanity is an index to the development of non-agricultural activities which are limited here. About 94% of the population is rural and 83.4% of the population is engaged in primary production. "The dependence on non-agricultural sources of income which implies development of transport; industry and services as well as growth and extension of towns coupled with springing up of commercial centres is applicable only to a small proportion of population".³⁸ Most of the towns are district or tahsil headquarters or were the headquarters of erstwhile princely states. Sabathu, Dagshai, Jutogh, Kasauli, Solan, Yol, Dalhousie and Bakloh are cantonment towns. Simla, Dharamsala and Dalhousie are hill stations also. Narkanda, Poanta,

Nainadevi and Kangra are important as religious centres. The various towns have developed as route centres; 7 towns are situated on Pathankot-Kulu road, the lifeline of Himalayan Beas Basin, 7 towns on Kalka-Simla road and two further on Hindustan-Tibet road. There is no town beyond Rampur. Chamba on the Ravi, Kulu and Mandi on the Beas and Rampur and Bilaspur on the Sutlej are situated on terraces. The route junctions with the regional roads, have recently attracted servicing units and if central functions are added to such sites, they may be invigorated to grow in size and may ultimately become active central places. In the former times a fort formed the nucleus of small urban community. Under the hill chiefs towns like Kot Kangra earliest notice about which is found in 470 A.D. flourished for a time becoming seats of Arts and Culture.³⁹ But these urban habitations decayed with the end of hill chiefs. Sujanpur is now a shadow of its former glory that it reached under the reign of Raja Sansar Chand (1775-1823). A new lease of life to some of the old fort towns was granted by instituting nearby on more accessible sites the administrative offices of tahsils or districts. The absence of large urban centres is due to the

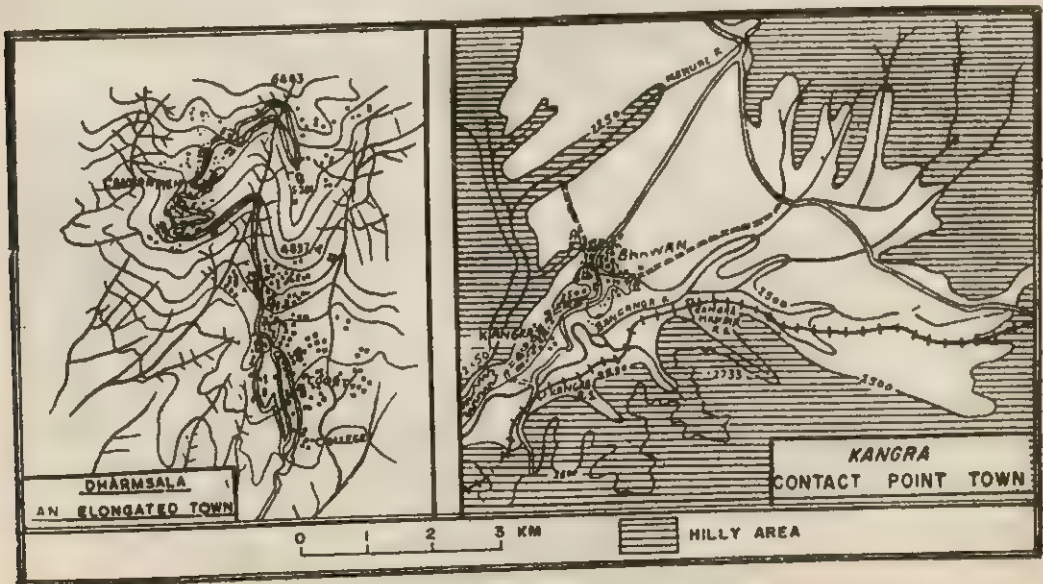


Fig. 9.18

confined nature of hilly terrain and also because of the fact that the simple and poor village communities have few needs and do not keenly feel for the services of the towns. The habitations thus do not get the sap for growth from the surrounding areas. Thus both physical and economic factors inhibit the growth of urban centres. The various types of small towns (Figs. 9.18 and 9.19) combine several functions and include large areas which are almost rural.

Simla ($31^{\circ}6' N$ and $77^{\circ}10' E$), the largest town of the region and the capital of Himachal Pradesh, (Fig. 9.20) has an area of 11.2km^2 and a population of 42,597 (1961). It is situated on a high ridge at an elevation of 2205 m. It was formerly approached by motor road and mountain railway from Kalka, but now it is approachable by road from Kangra, Mandi and Nahan also. The first

residence was built in 1819 and it became the summer capital of Government of India in 1864 and also of Punjab Government in 1871. Since then Simla flourished as an administrative, institutional and commercial centre. It received a set back when the Government of India after 1947 and the Punjab Government decided to leave Simla as their summer capital, but it somewhat resuscitated when it became the capital of Himachal Pradesh.

Simla has fine climate (mean summer max. temperature 19° to 28°C) and very fine scenery. Simla, the 'Mountain city of India' is also the largest hill resort. It has magnificent public buildings, several first class hotels, shopping centres and recreational facilities.

The town has a linear pattern. It lies in an elongated manner from about Rashtrapati Niwas

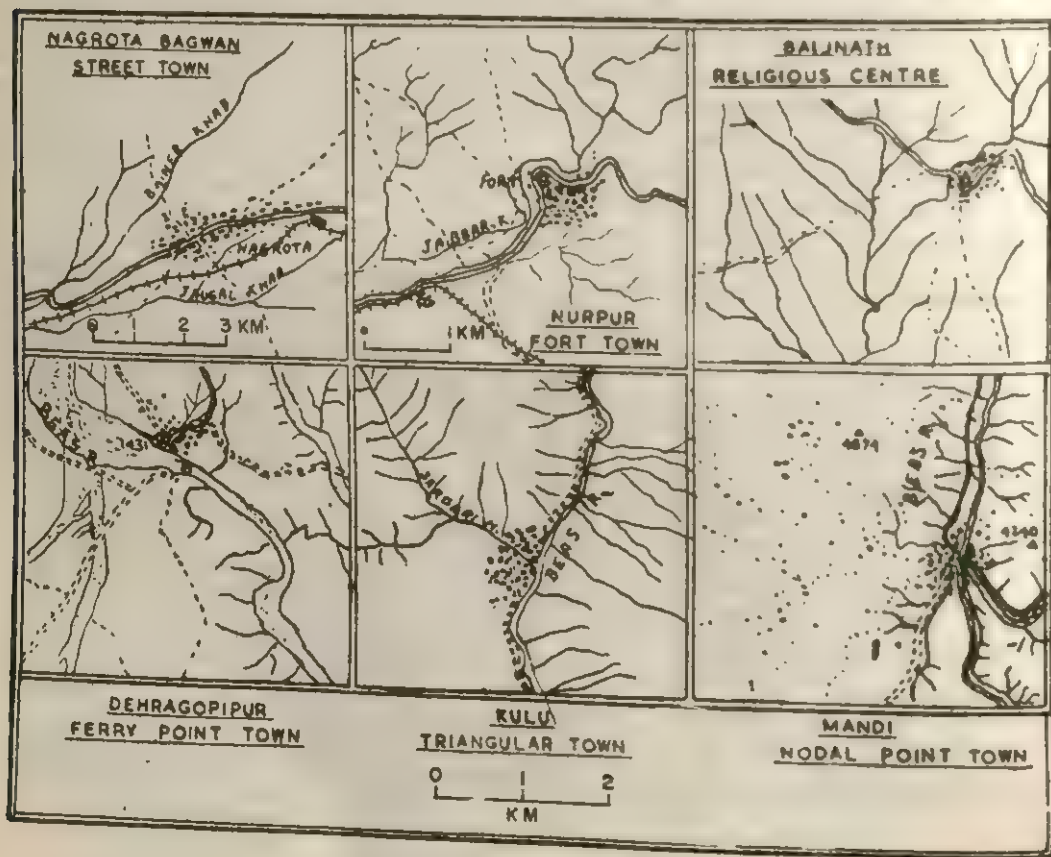


Fig. 9.19 : Himachal Town Types

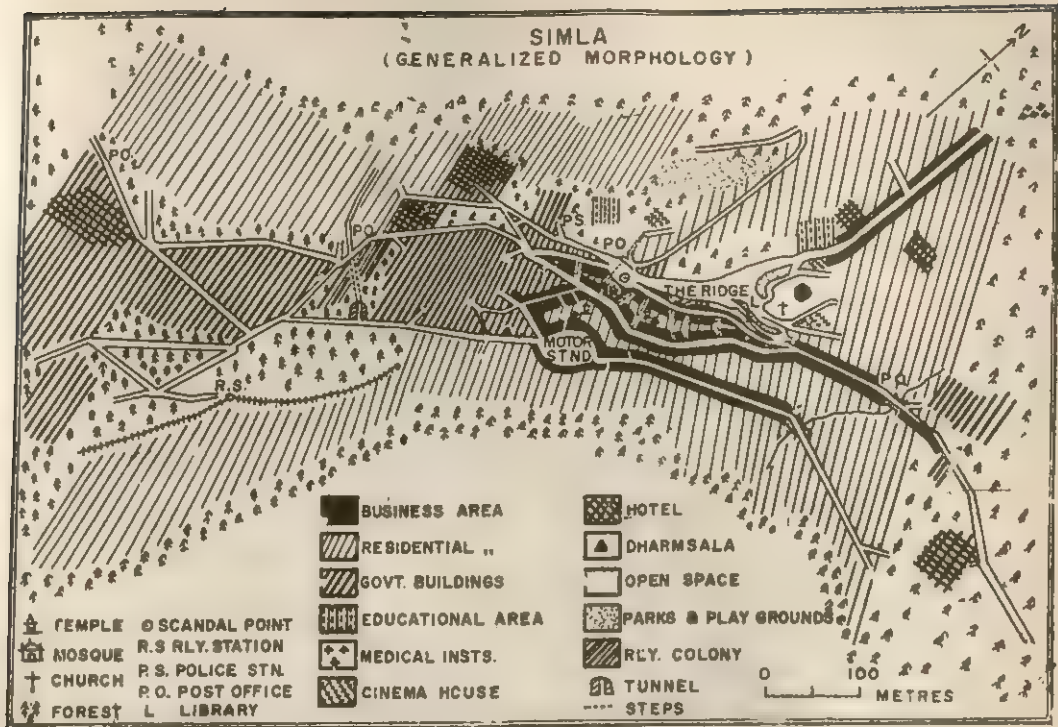


Fig. 9.20

on Observatory hill to Jakhu hill. The main road runs all through. Strung along this central belt are main offices, bazars and residences. The central point lies between town hall and Christ Church. The market below, known as *Lakkar Bazar*, is a low narrow congested zone. About 3 km below the ridge, the heart of Simla, lies Annandale, a pretty ground. The reservoir for drinking water for the town is located underneath the Jakhu hill. Water is pumped from catchment area 13 km away. The electric supply is obtained from Chabba power station, diesel station at Simla and Nangal power supply. Simla has no major industry but it is an important commercial centre of Himachal Pradesh.

The occupational structure of Simla shows that out of 18,334 workers, 10719 are in other services; industry, manufacturing and construction employ 3,335, trade and commerce 2,081, transport and communications 1,072 and primary production 479 only.

Kangra may be considered as an example of small administrative town in Himachal (Fig. 9.21). Kangra is an old town said to have been established by Raja Susarma Chandra after the war of Mahabharata; its recorded history goes back to A.D. 6th century. It was then known as Nagarkot and was the capital of the hill province of the kingdom of Jalandhar. Such was the prestige and strategic importance of its strong fort that it was stated that "he who holds Nagarkot, holds the hills". During the reign of Sansar Chand Kangra became an important centre of commerce and art. Plastic surgery, gold and silver work, stone carving and Kangra school of Painting became well known. Due to Kangra earthquake of 1905, the town suffered much destruction.

Kangra lies in the valley of the same name at an average elevation of 712 m at contact point between the high Dhauladhar to the north and the low hill country to the south. The town is

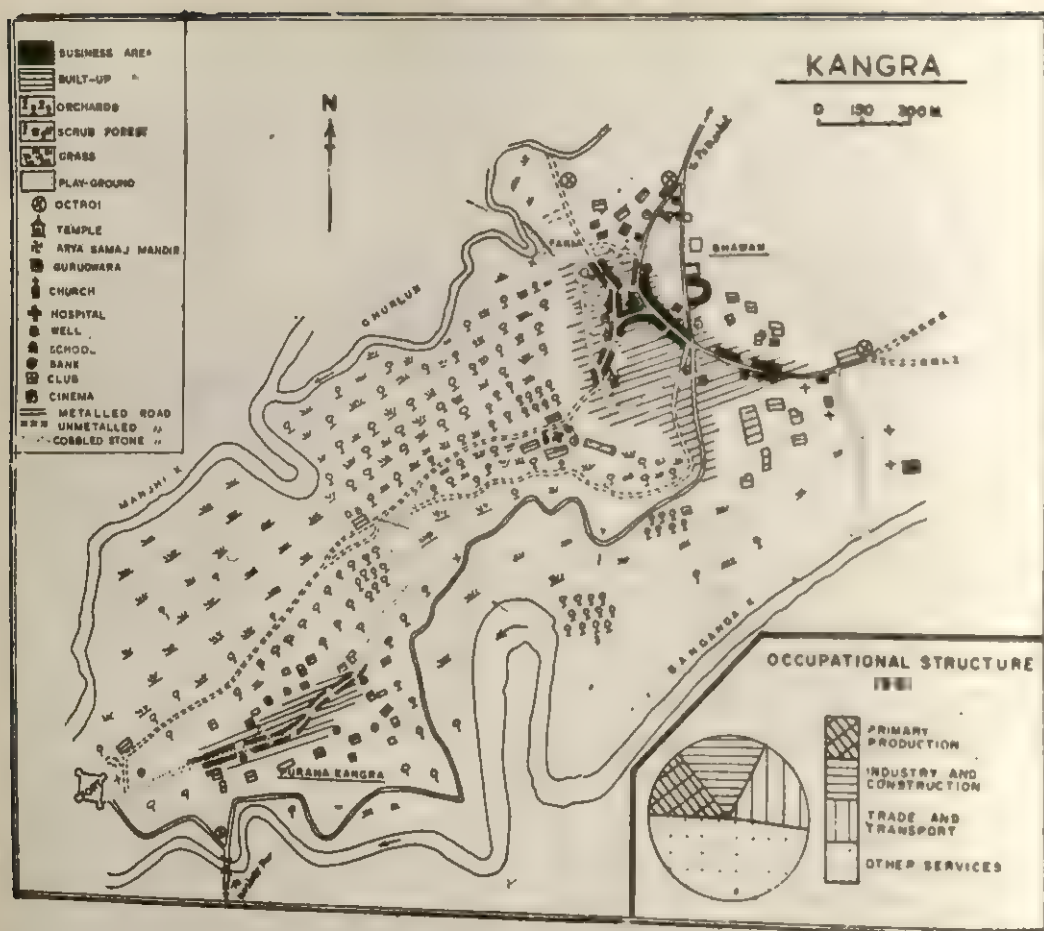


Fig. 9.21

spread over a level tract and an adjoining hill between the Banganga and Manjhi streams. The two parts of the town, Purana Kangra and Bhawan lie on either ends with the highest point in the centre. The fort and the gilded copula of the Mata temple stand out as landmarks. Kangra is well situated from the point of view of transport and commerce and also occupies a strategic position. The earliest nucleus developed as a small habitation below the fort. The celebrated fort and the presence of inaccessible cliffs and river gorges provided necessary protection from external dangers. Bhawan gradually became more important than old Kangra as factors of peace rather than protection became

established, and accessibility rather than seclusion played the deciding role in urban development.

The town suffered fall in population due to Kangra earthquake (1905) which was regained only in 1951. 95% of the total population (1961—5,775) is Hindu (1961). In 1961, out of the working population, 14.2% were engaged in primary production, 18.6% in industry and construction, 19.1% in trade and transport and 48.1% in other services. Kangra has thus a more diversified occupational structure than many other small towns of the region.

The two parts of the town, Purana Kangra and Bhawan, are connected by three roads running one above the other. Purana Kangra has a

simple plan. A cobbled road runs in the middle leading to the gate of the fort. On either side are rows of shops and behind them are dwellings scattered in small groups and approached by short paths from the market road. The Bhawan has developed along the Main Bazar road extending from Suraj Kund to Chakra Kund. The *Chauk* lies at its crossing with the Mata Temple-Club road. An arcuate pattern has developed along the Tahsil-Suraj Kund road strung with administrative buildings, residences etc. Good residential houses have sprung up along Suraj Kund road, Hoshiarpur road and School road and a few have been built by the Christian mission on Malkara hillock. Houses are generally two storeyed with a compound. The town has banking, water supply and electric supply facilities. Kangra though a small town, is picturesque and pleasant and well provided with necessary amenities.

The Economy

Agriculture

Agriculture is by far the most important occupation. More than 93% of the population is directly or indirectly dependent on agriculture for its livelihood. The varied topographic and agro-climatic conditions permit the cultivation of a wide variety of crops and fruits ranging from sub-tropical to cool temperate. However, agriculture in general is handicapped by steep and hilly terrain, hazards of climate, small and scattered holdings, thin stony soils, limited irrigation and small cultivated area. The scope for increasing cultivated area is not much. Only about 10% of the area is cultivated. To secure agricultural land, rugged terrains are arduously terraced even on such steep slopes where the land should be left under pasture or forest. Where the slope is steep, "the fields are no bigger than a billiard table."⁴⁰ Since alternative sources of livelihood other than agriculture are limited, the peasantry has to eke out its existence under difficult conditions where nature is a stern mother. However, in Himachal, what nature has denied in land area may to a large extent be made up by fruit culture and optimal use of cultivable area.

Beyond 3000 m little commercial use of land is possible. Only one crop can be grown in those parts where winter is severe as in Pangi, N. Kinnaur and Lahaul and Spiti. Actually, of the total area, only about 0.3% in Lahaul and Spiti, 6.4% in Simla and 12.4% in Kulu is arable. In the valley areas it increases to 21.9% in Kangra and 37.6% in Hamirpur. The only areas where level and extensive agricultural land is available are found in Sirmur, Bilaspur, Mandi, Kunihar and Rohru in Mahasu, Bhandal in Chamba and Kangra and Kulu valleys. Large areas are unsurveyed and official records are based on land use of measured area according to village papers. Thus the assessment of agriculture is handicapped by general difficulties regarding data. However, the general trend of land use over the years shows that net sown area has increased only marginally from 526,100 hectares in 1956-57 to 534,400 hectares in 1964-65 and 546,585 in 1967-68. Fallows have remained almost unchanged. Barren and uncultivable land area has diminished to some extent. Any further encroachment by agriculture on pasture land and forest would be harmful. 65.5% of the net sown area is double cropped due to climatic, irrigational and manurial factors. Holdings are small. Average holding is less than one hectare and this includes pasture land also.

Irrigation is carried on by means of *Kubls* or diversion channels. *Kubls* are costly to maintain and hill-slides cause failure enblock; therefore emphasis in the IVth plan is on lift irrigation. "The programme of rural electrification has been adjusted to cater for lift irrigation schemes"⁴¹. Rs. 60 million have been provided in the IVth Plan, and is estimated to contribute 20,000 tons of additional food production. Only 11.5% of the total agricultural area of Himachal Pradesh is irrigated (1967-68). Dependence on irrigation is greater in the dry areas like Lahaul and Spiti where 96.6% of the agricultural area is irrigated.

However sceptical the hill peasant may be of the advantages of deep ploughing and weeding, he is fully alive to the importance of manuring and chemical fertilizers.⁴²

Crop and Cropping Pattern : Wheat is the leading crop in acreage but takes second place in production. Maize comes next in acreage but has greater production. Rice, barley, pulses, millets, gram, potato, fruits and ginger follow

in respect of acreage. The cropping pattern is characterized by the predominance of food-grains. This emphasis on foodcrops rather than on fruit and cash crops is mainly due to lack of transport facilities.

TABLE 4

Crop Area and Production of Principal Crops (Area, '000 hectares Production, '000 tons)

Crops	1966-67		1967-68		1968-69*	
	Area	Production	Area	Production	Area	Production
1	2	3	4	5	6	7
Maize	239.627	364.103	292.480	392.758	252.062	419.221
Rice	95.514	82.411	99.514	112.198	96.021	98.480
Millets	24.950	10.153	33.094	12.894	26.978	19.522
Ragi	13.107	5.897	13.886	7.327	13.857	10.457
Total Kharif	405.698	472.622	436.397	640.171	429.635	561.088
Wheat	268.670	169.374	315.738	268.099	312.484	259.058
Barley	39.135	43.014	45.470	53.305	35.047	51.239
Gram	10.997	3.212	22.436	9.408	17.468	7.845
Rabi Pulses	5.642	1.145	(given in Kharif)		3.474	0.780
Total Rabi	324.444	216.745	383.644	330.812	268.473	318.922
Total	730.142	689.367	820.041	870.983	789.108	880.010

Source : Himachal Agriculture College and Research Institute, Solan.

* Figures of 1968-69 are provisional.

Pulses which can grow in low rainfall regions occupy a larger area in the southern tracts. A harmful effect of this cropping pattern is that the diet of the people in mountain districts suffers from protein deficiency as a good source of vegetable protein are not grown there.⁴³ Another feature is that there are no crop tracts as such although some areas are better suited for certain crops. Of the two crops, Kharif is by far the more important in area as well as production. The predominant Kharif crops are maize and rice followed by pulses. Maize has 24.8%, rice 7.7% and millets and ragi 2.2% of the total cropped area. Wheat (31.4%), barley (14.9%), gram and pulses are main rabi crops.

Crop Association : The impact of climate, soil, relief and agricultural practices is reflected in its crop association (Fig. 9, 22A). The predominant crops of the region are wheat, maize, barley and millets which are combined variously with rice and pulses to form different crop associations.

The oil-seeds and other crops are less significant. The Trans-Himalayan, cool, dry and rough terrain areas of Lahaul and Spiti have barley-wheat association, while Kinnaur has millets-barley-wheat association. Wheat forms the first order crop in Kangra, Mandi, Kulu, Mahasu and Sirmur districts with the association of maize-rice in Kangra and Mandi, maize-barley in Kulu, maize-millets in Mahasu and maize-rice in Sirmur. This may be called the wheat region. Maize is the first order crop in Chamba, Bilaspur and Simla, the successive associations being wheat-barley, wheat-pulses, and wheat-barley. This may be called the maize region though it does not form a continuous zone. Maize is second order crop in 5 districts (Mahasu, Mandi, Sirmur, Kangra and Kulu). Wheat or maize constitutes the first crop everywhere south of the Great Himalaya. Maize is more dominant at higher levels and is often unirrigated while rice occupies the lower terraces and valley bottoms. Maize is negligible

or absent in rigorous Trans-Himalayan tracts of Kinnaur and Lahaul and Spiti. Wheat is grown

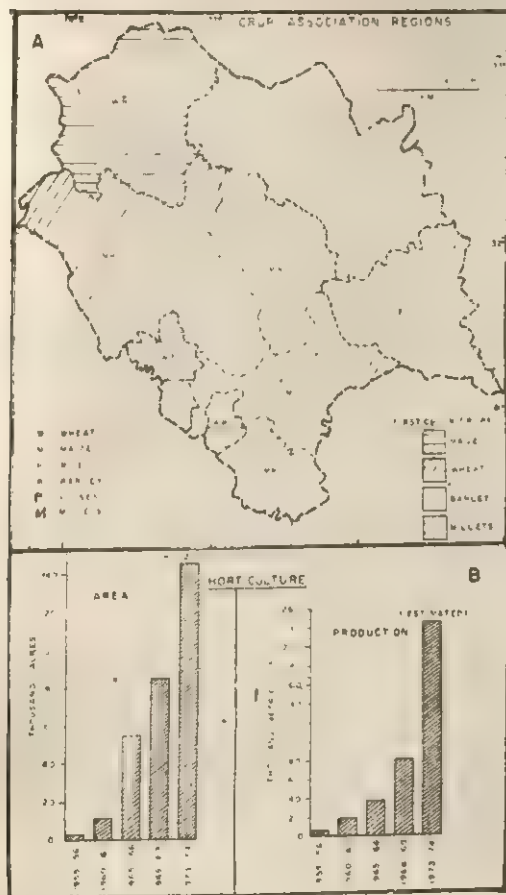


Fig. 9.22

extensively because of its wide adaptability and occupies a place of first rank in 5 districts, 2nd rank in 4 districts and 3rd rank in 1 district; thus it is significant throughout Himachal. Millets are important in Kinnaur (52.9%) only, while barley is important in Spiti (71.1%). Rice occupies third rank in Kangra, Mandi and Sirmur. Bilaspur is the only district which has pulses in the third rank, otherwise these have less significance elsewhere.

Horticulture : Horticulture has special significance from the point of view of better land use and amelioration of the economic conditions of the people. The average income of a farming

family was worked out to be Rs. 353.26 (1964-65). However, a gross income of Rs. 29,000 to Rs. 37,000 per hectare from a well-managed orchard is no longer a surprise. Therefore, area under horticulture has increased from 1,950 acres in 1950-51 to 74,550 acres in 1967-68. At the end of Fourth Plan horticulture is expected to contribute Rs. 60 per capita. Himachal can be divided into 4 horticultural zones. Table. 5 (A & B) shows Horticultural Zones and area under fruits. The zonation is not rigid as some fruits can be grown in more than one zone also. For example, in Kulu valley, apples are grown from 1,050 m upwards because Kulu is situated very much in the interior and is near the permanent snow line. This provides suitable conditions for successful growing. Himachal Pradesh was the first State in India to start progeny-cum-demonstration orchards whose number is 95 now. Fruit plants are also exported to other States. Out of 74,550 acres under fruits, 43,267 acres are under apples. Kotgarh and Kulu apples are well-known and Himachal may well be called "The Apple State of India".

By the end of 4th Plan, the area under fruits will go up to 145,000 acres. Annual production of fruits has increased from 7,000 metric tonnes in 1955-56 to 81,000 metric tonnes in 1968-69 and is likely to go up to 245,750 tonnes at the end of 4th Plan (Fig. 9.22 B). Most of the fruit is exported. An experimental fruit canning unit was set up in 1959-60 at Naubahar (Simla). Its canned fruit has found wide favour and ready to serve *sarson-ka-sag* is being exported abroad. Himachal has the proud privilege of having won the first *Udyan Pandit* award of India in 1959 for the best apple orchard (Kotgarh) in India.

Potato Cultivation : Potato is a cash crop grown in abundance. It is remarkable that even coarse hill soils are able to produce fine crops of potato. Potato tubers grown in cold regions have a special value as they are used for seed purposes. During 1968-69, the area under potatoes was 15,973 hectares and the production was 71,777 tonnes. The seed potato grown here is in great demand all over the country. Because of the higher return value of seed potatoes, their cultivation is

TABLE 5
A. Horticultural Zones

Zone	Approximate Elevation (in m)	Important Fruits
1. Lower Hills and Valley Zone	350-920	Sub-Tropical Fruits like Litchi, Loquat, Guava, Citrus Fruits, etc.
2. Mid-Hills Zone	920-1520	Stone Fruits like Peach, Plum, Apricot, Persimmon, Pear, Pomegranate, etc.
3. High Hills and Interior Valleys	1520-1750	Apple, Cherry, Pear, Walnut, Chestnut, etc.
4. Cold and Dry Zone	1520-3650	Raisin, Grapes, Prunes, Drying varieties of Apricot, Grapes, Chilgoza, and Apple, etc.

B. Area under Fruits (1967-68)
(acres)

District	Apples	Other Temperate Fruits	Nuts & Dry Fruits	Citrus Fruits	Other Sub-Tropical Fruit	Total
Mahasu	21,643	3,245	697	554	128	26,267
Sirmur	3,119	864	188	1,577	514	6,262
Bilaspur	...	280	...	380	796	1,456
Mandi	4,947	1,759	484	1,787	1,102	10,079
Chamba	620	250	121	260	132	1,383
Kinnaur	979	190	424	...	...	1,593
Kulu	10,980	1,738	328	156	2	13,204
Kangra	615	2,960	335	4,600	2,617	11,127
Simla	329	2,086	60	508	125	3,108
Lahaul & Spiti	35	30	6	...	...	71
Total	43,267	13,402	2,643	9,822	5,416	74,550

extending largely at elevations over 1,800m as potatoes grown at such high altitudes are free from virus. Potato development however needs closer examination. The farmers have been growing the crop on sharp hill slopes, sometimes as acute as 70° and this has resulted in heavy soil erosion. The yields of potato are also low. The Central Potato Research Institute, Simla has done much useful work in developing high-yielding and disease-resistant varieties of potatoes. Amongst the blight-resistant varieties developed

there for Himachal are *Kufri Jyoti* and *Kufri Jeevan*, for Assam hills *Kufri Naveen* and *Kufri Khasi-Garo* and for Nilgiri *Kufri Neelmani*. The Institute's breeding and seed certification station at Kufri has also developed high yielding varieties like *Kufri Sindhuri*, *Kufri Chandramukhi* etc. *Kufri Sheetman* is suitable for cold areas.

Some Other Cash Crops: As a cash crop, ginger is no less important. The soil and climatic conditions of the region are favourable for the production of quality ginger which fetches high prices.

Research work on varietal and agronomic aspects of this crop is being conducted at Ginger Development Station, Harlo (Sirmur). The area under Ginger in 1968-69 was 1,661 hectares and production 970 tonnes and by 1970-71 the production is likely to be 5,100 tonnes. For the development of vegetables, ten vegetable Development Stations have been set up at different levels. Research work and production of temperate vegetables is developing successfully. Latest to be added to the list of cash crops is cultivation of mushrooms which hitherto grew wild. The research laboratory at Solan is supplying spawn and technical guidance to the growers. Himachal is suitable for the production of vegetables (including off-season) and flower seeds. Large quantities of vegetable seeds are produced. At present, seeds worth Rs. 300,000 are produced and their production will be worth Rs. 1,000,000 by the end of 4th Five Year Plan. The off-season and other green vegetables worth Rs. 2,500,000 are exported annually and the figure may be as high as Rs. 10,000,000 by 1973-74. Keeping all this in view, vegetable development and research schemes have been taken up at various levels. Other notable cash crops include *Kuth*, sugarcane and medicinal herbs.

Tea: Certain areas in Himachal region are suitable for its cultivation. Palampur tahsil in Kangra district is the best tea growing area. Tea cultivation was introduced in 1849 by Dr. Jameson. There are about 40 tea gardens in the area. The methods of cultivation are unscientific and inputs are very inadequate with the result that yield is low and quality poor. Though the area can produce tea of the standard of Darjeeling or Assam, the present quality is not as good. The green tea of Kangra had good market in Kashmir, Iran, Afghanistan and Central Asia etc., but now the demand has decreased. Total production during 1967-68 of all qualities of tea was 8,379 quintals.

Animal Husbandry: In a predominantly agricultural economy animal husbandry plays a vital role for supporting agricultural operations, for supplementing food and for providing means of transport and sources of manure.

Large number of cattle, sheep and goats are kept but they do not receive adequate nutrition. The livestock wealth is as follows:

TABLE 6
Livestock 1966
(in thousands)

Livestock	Number
Cattle	1,892
Buffaloes	415
Sheep	1,049
Goats	813
Horses and ponies	14
Mules and donkeys	1
Pigs	3
Other livestock	4
Total	4,201

Amongst cattle 615,000 are milch cattle. In addition to livestock there are 207,000 poultry. For the maintenance of healthy cattle, nutritive fodder is of paramount importance. The main obstruction for this at present is non-availability of seed and other planting material and small area under fodder crop. There is also shortage of concentrates and other feeds. Thus it becomes important to devote more attention in popularizing cultivation of high yielding nutritive crops, improvement of grass lands and conservation of seasonal surplus forage. Himachal cattle are small and hardy. The hill cow and buffalo are poor milkers. Even imported breeds do not do well and suitable breeds for the hills are being developed. Over-grazing, erosion and grass fires have brought in an invasion of weeds and inferior grasses in pasture lands. A programme of grass land and range management is being initiated. The number of transport and pack animals is small and is well below the requirements of a hilly region. Cultivators often keep a few heads of sheep and goats for wool, milk and manure and occasional use for mutton. Sheep rearing is very paying and plays a major role in the economy of those living in the high hills. Semi-pastoralists of Pangi, Bharmour, Chhotta and Bara Bangahal, Kinnaur, Mahasu,

finer waters and also very slow growth rate, the species have not been found to be economical for pond culture. Mirror Carp (*Cyprinus carpio*) and its allied varieties have been found very suitable for culture in this region. In the ponds, lakes and reservoirs, there is great scope for extension of culture of this species.

(ii) Mountainous Region : This region comprises of area above 1500 m having perennial snowfed streams. This area is most suitable for culture of trout, the famous sporting quality. The development of trout will also encourage growth of tourist industry.

Trout and Mirror Carp find important place in development schemes. Properly managed pond will yield 2000 kg to 2,500 kg of fish per hectare annually, which can fetch to the farmer Rs. 5000 to 7,500. To encourage fish culture in Himachal, Fisheries Department arranges to supply fish fingerlings free of cost to prospective fish farmers.

Industries

Himachal Pradesh though having sufficient resource potential is one of the least industrialized regions of India. Only a small percentage (7.9%) of population is engaged in industry and construction. The remote situation, certain geographical conditions such as difficult terrain and severe winters, lack of adequate transport facilities and other infra-structure and various historical factors have been obvious hindrances in industrial development. The region, however, enjoys certain advantages for industrial development such as cheap labour, cheap motive power and easy availability of raw materials like timber and wool, etc. With the formation of Himachal Pradesh and gradual improvement of communications industrial development is gradually taking place.

Power and Mineral Development : Himachal has a large hydel power potential (8.5 million kw) amounting to 15% of India and 90% of northern India. The total installed capacity on the eve of 5 Year Plan was only 359 kw. Even at present Himachal is generating only about 0.03% (2,635 kw) of its power potential.

The generation and consumption are both not commensurate with the large power potential.

Until 1963 no serious attempt was made even to estimate the power potential within the region. The Board of multi-purpose projects and power development was established in 1964. Systematic hydrological, topographical and geological surveys of various basins are in progress. The power potential of Himachal Pradesh by river basins is estimated as follows :

TABLE 7

Name of River Basin	No. of hydel schemes	Power generation (MW)
1. Chenab Basin	4	760.0
2. Ravi Basin	9	499.8
3. Beas Basin	7	3,009.1
4. Sutlej Basin	13	3,465.6
5. Yamuna Basin	3	795.1
Total	36	8,529.6

It is significant that rainfall supplemented by snowmelt assures a perennial supply of water for hydroelectric generation. The projects (Fig. 9.24A) would provide Himachal and northern region with bounties of cheap electricity in large and increasing measure. So far due to constitutional and other factors, only other States like Punjab and U.P. availed of the opportunity to harness Himachal waters as in the case of Bhakra, Jogindarnagar, Beas-Sutlej link and Kishau projects. Himachal is now exploiting the resources through her own agency. At present the following power generation schemes are being executed:

A. Major Generation : (i) **Giri Multipurpose Project :** The Giri Multipurpose Project (Fig. 9.24B) costing Rs. 89.10 million has been planned to be executed in 3 stages with a total estimated general potential of 0.201 mill. kw. The stage I of the project envisages the construction of a barrage at Jateon downstream of Dadahu to divert waters of Giri into a 11.5 feet diam., 3.9 mile long lined tunnel aligned through the ridge separating the Bata and Giri catchments to obtain gross head of 588.5' for power generation at Majri power house with an installed capacity of 60,000 kw. The tail waters of this power house will be led through a 16,000' long channel

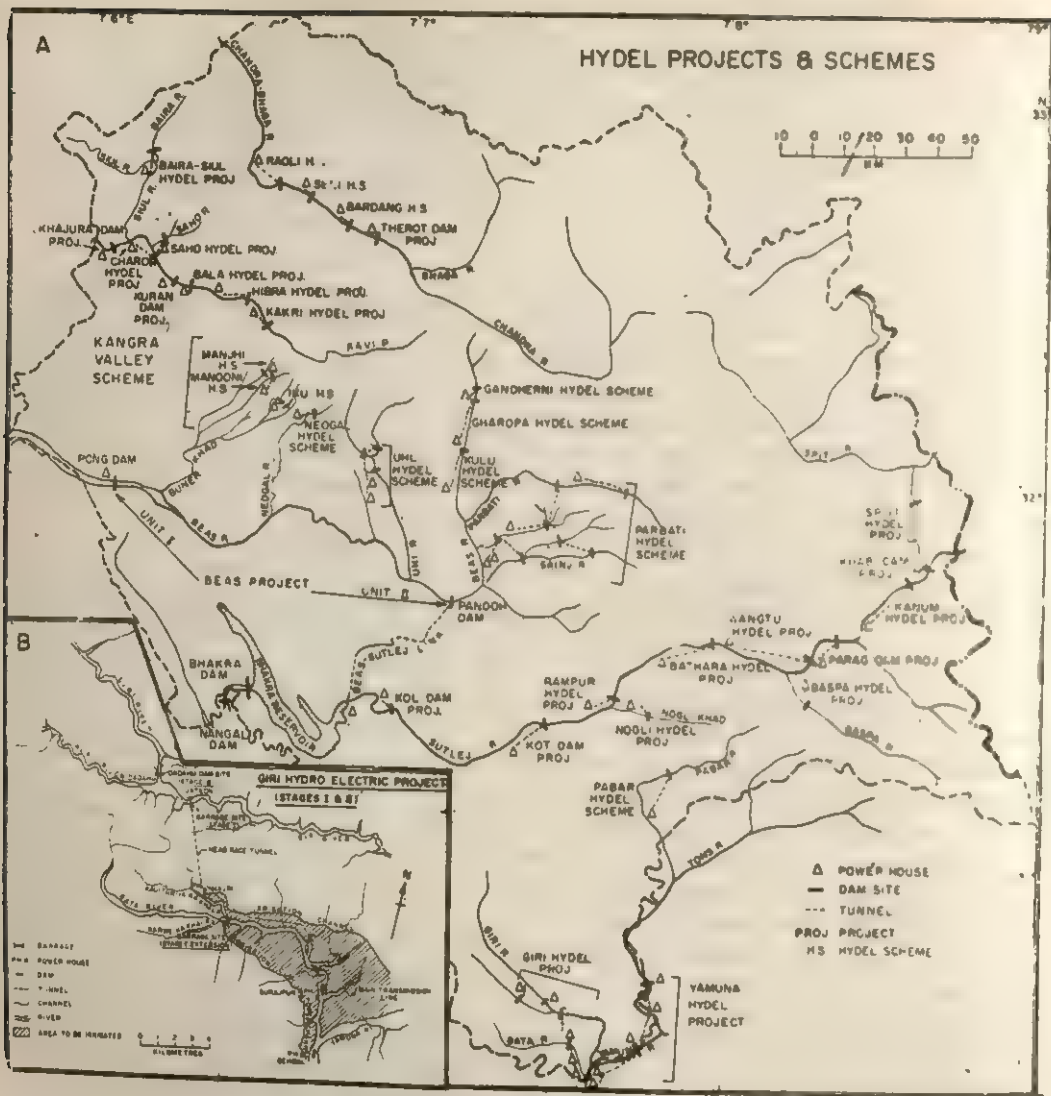


Fig. 9.24

discharging into Kaun-thriya-ka-Khala, a tributary of River Bata. The irrigation channel of 50 cusecs capacity taking off from the tail channel will command an irrigated area of 24,282 hectares located on the left bank of river Bata. The project will be completed by 1972.

(ii) Uhl Hydroelectric Project : 1st Stage : The first stage comprised diversion of discharge of 130 cusecs by weir across river Uhl at Brot and a tunnel to utilize fall of 518 m in Shanon Power

House. The power house with an installed capacity of 48 MW has already been constructed.

II Stage : It is envisaged to utilize the tail race water of existing Shanon Power House at Bassi. The power house utilizing a gross head of 350 provides for an installed capacity of 45 MW. It is envisaged further to construct about 61 m high dam at Ghog to enable augmentation of discharge to 600 cusecs which will be utilized in both the Shanon and Bassi power houses. On

completion of the project, 60 MW of electric power will be generated. It is expected that two units will be commissioned in 1970 and the third in 1971.

B. Medium Generation : A number of medium generation projects including microhydel schemes have been taken in hand such as Nogli, Mehbar, Rukti, Gharola, Billing and Shansha. Hydro-electric projects like Parbati (1,880 MW) and Kol Project (320 MW) are being investigated for power generation.

Rural Electrification : Great importance is being attached to rural electrification. The main difficulty is that villages are situated widely apart in difficult terrain and have small population. Even then the progress of rural electrification is satisfactory. By 1969 about 1/5 of the villages of Himachal have been electrified. As compared to this, the rural electrification on 30-9-1967 in U.P. and Bihar was 9.42% and 8.48% respectively. During the 4th Plan about 33% of rural population will have the benefit of electric supply.

Considerable progress has been made in the localization of mineral-based industries. A cement factory at Rajban (Sirmur) is planned to be set up soon by Cement Corporation of India and cement factories at Bilaspur and Kangra are under active consideration. These would meet the demand of Himachal Pradesh. Minor industries based on pyrites, barytes etc. have already come up in Poanta area.

Himachal has developed capacity for a large number of agro-based, forest-based, engineering and chemical industries (Fig. 9.13). There is no heavy concentration anywhere. There are three areas of small concentration, viz. (i) Nahan-Poanta tract, (ii) Simla-Solan tract and (iii) Kangra-Mandi-Kulu tract. Elsewhere, industries are located at isolated centres like Chamba and Bilaspur. The vast area east of Chamba-Kulu-Simla-Nahan Tract is practically without any significant industries.

A number of institutions like the Himachal Pradesh Industrial and Mineral Corporation, Himachal Pradesh Finance Corporation and Khadi and Village Industries Board etc. have

been set up to assist industrial development. Effort is being made during the IV Plan to divert the pressure from the land towards industries. It is considered that the dust-free climate is suitable for the setting up of optical, electronic and other allied industries. The IV Plan provides an outlay of Rs. 80.23 million for large and medium, mining and village and small-scale industries.

Nahan Foundry Ltd., Nahan, the only public sector undertaking in the region, has been able to switch over from the manufacture of bullock-driven cane crushers to the manufacture of sophisticated items like electric motors and special castings. Mono-block pumps are being exported to Andhra Pradesh, Bihar, Uttar Pradesh, Punjab, Haryana and other States. Modernisation and expansion of foundry is planned and another unit 'Nahan Electricals' is also being set up. There is one sugar factory at Poanta. Solan is important as a brewery and distillery centre; their total production in the region is 4,801,000 litres. Forests are not only a source of numerous major and minor forest products but are basis of a number of industries such as timber, rosin and turpentine etc. During 1967-68 Himachal forests produced 398,000 cubic m of timber, 838,000 cubic m of fuel, gum and resin (Rs. 7,508,000), fodder (Rs. 3,720,000) and other products (Rs. 1,070,000).⁴⁴ There are already in the region two rosin and turpentine factories, one each at Nahan and Bilaspur producing 2,891 tonnes of rosin and 726,000 litres of turpentine. There are saw mills in several towns.

Himachal has developed several small-scale and rural industries. It is rich in the production of wool, shawls (about 15,000 pieces), scarves, blankets, tweeds, *Gudmas* and *Namdās* etc. which are produced on a cottage industry basis, particularly in Kulu, Mandi and Chamba. In addition, there are numerous smaller centres. One shoddy wool spinning centre has been commissioned at Poanta. The Govt. of India has permitted the import of Rs. 1.15 millions worth of wool tops for boosting hosiery and handloom industry. Fruit-packing industry has developed in Chamba, Kangra, Kulu, Mandi and Simla (particularly Kotgarh). Fruit and vegetable preservation units are de-

veloping in Kulu, Simla, Mandi and Mahasu districts. Kangra and Mandi districts are ideally suited for sericulture. Production of silk yarn has started in Silk Filature Factory at Nurpur. Weaving of silk is carried on a small scale in Kangra. The silk seed production centre at Palampur is scientifically equipped. The Govt. of India has allotted two rural industries projects, namely, Palampur Project and Mahasu Project. The Palampur Project is meant for sericulture and tea industry and Mahasu Project is concentrating on all-round rural development including industries. Production of honey through apiculture is well established in Himachal Pradesh as extensive bee flora exists in the hills. Important areas for production of honey are Kangra, Kulu, Chamba, Mandi and Mahasu. Bamboo works at Kangra is an interesting example of formerly an unimportant industry now established on scientific lines using Japanese method. Well treated and designed bamboo articles find sale locally and in emporia. Himachal is also known for certain other products like Chamba *rumals* and *chappals*, Simla sticks, Jwalamukhi *Dhoop*, Kulu caps and shawls, etc. Rice husking, oil seed crushing, flour mills, (both water and electric) are common to most of the towns and rural centres. About 2400 guns are also made.

Tourism: Himachal Pradesh is ideally suited for the promotion of tourism (Fig. 9.13). An additional advantage besides income is that tourism helps conservation. Stamp aptly quotes: "I like selling scenery because at the end you still have it." It is however surprising that such beautiful areas have so long remained in oblivion when few other Himalayan resorts compare with these vales in beauty so rich in scenic glamour, in human elements and historic and religious associations. The bounteous valley of Kangra, the orchard laden quiet but superb Kulu and Mandi, the invigorating mountain resorts of Dalhousie and Simla and the high glacier garlanded Dhauladhars, Pir Panjal and the Great Himalayan and Zaskar ranges offer a world of fascinating choices to the discriminating tourist. The valley of Chandra Bhaga in Lahaul, though remote, is an area of pristine

loveliness. Spiti is unique—isolated, rugged and bleak. There are numerous lakes like the new Gobind Sagar, the picturesque Renuka, the saucer shaped lake of Khajjiar, the deodar fringed Dal and the sanctified Rewalsar lake. Chamba, Manimahesh, Manikaran, Kulu, Kalpa and Keylong are names that conjure up beauty and serenity. The rivers have plenty of trout and other fish, the valleys and lofty mountains are a paradise for the trekker and the mountaineer. Besides, Himachal is the country's orchard known for its excellent fruit. The region is also endowed with numerous mineral springs such as Manikaran, Tatwani, Loonsu and, Bashist. The opening of Himalayan mountaineering institute at Manali is welcome addition for hikers and mountaineers. Himachal now has facilities for winter sports having ice-skating at Simla and skiing at Kufri. Interesting fairs are the colourful Dussehra of Kulu, the Minjar of Chamba, the Renuka fair and Lavi fair of Rampur. Kangra, Jwalamukhi, Poanta, Naina Devi ji, Chintpurni, Manimahesh and Rewalsar are some of the well known religious places which are frequented by large number of visitors.

Although natural assets for tourism are abundant tourist facilities are not sufficiently developed. The various plan provisions for their developments are still inadequate.

Three distinct tourist complexes are being developed in Himachal Pradesh. In these complexes tourist facilities will be concentrated so as to make for integrated development of tourism: (i) Kulu-Mandi-Manali-Jogindarnagar-Palampur-Kangra-Dharamsala-Dalhousie-Chamba complex. (ii) Simla-Naldera-Tattapani-Chherabra-Kufri-Narkanda-Solan, Kasauli-Chail complex. (iii) Nahan-Rainuka-Poanta Sahib complex.

The earnings of Tourist Department from provision of accommodation in the tourist bungalows have risen from Rs. 8,000 (1965-66) to Rs. 1,30,000 (1967-68). The income is likely to go upto Rs. 500,000 by the end of Fourth Plan. Other varied economic advantages flow from investments ancillary to expansion of tourism such as a large variety of trades and industries relating to food, dress, transport and other

tourist accompaniments and direct and indirect employment to a large number of persons. Thus, tourism provides tremendous boost to the economy of the region.

Transport and Communications

Extensive, efficient and economical means of transport and communication are a *sine qua non* for economic, social and cultural development, particularly in the hilly areas. On account of remoteness of location and hilly terrain, Himachal has remained practically isolated. The hilly terrain ranging from 244 m to 6791 m and rapid streams have been formidable barriers in the development of the modern means of communication. Till recently the means of transport were meagre and people had to rely on bridle paths and on human and animal transport. Consequently the area remained backward economically and socially. The area, though rich in resources, is backward for the only reason that it has lacked terribly in proper transport system from times immemorial. Roads are therefore essential antecedent to all-round progress. Himachal is not compact as a territory nor are its villages compact as in the plains. Interlinking them means long roads through difficult terrain. The region has very limited rail and air links and is unsuitable for water transport except for floating timber. Ropeways could be provided for hauling timber, minerals and other traffic. Due to snowfall in the higher regions, passes are closed from December to April. High rainfall and nature of rocks combine to cause erosion, landslips and hinder transport. Large number of bridges are required across innumerable hill streams. It is exasperating to find that between Dharamsala and Malan, a distance of nearly 18 km., 46 bridges are necessary.

The region is presently served by two narrow gauge railways lines, the Kalka-Simla railway and Pathankot Jogindarnagar railway (Fig. 9.26). The railways naturally serve a limited purpose. The only transport by air is seasonal service between Delhi-Chandigarh-Bhuntar (Kulu). It provides quick transport between Kulu valley and the plains for both passengers and goods.

However, seasonal nature of the service limits its usefulness. Thus except for the limited service provided by rail and air, roads are the chief means of transport. However, they are inadequate. On the formation of Himachal Pradesh in 1948 the length of roads was only 426 km (0.98 km per 100 km)²; out of this only 288 km were motorable. While planned development of modern roads in India started in 1848, Himachal had to start almost from the scarp in this respect exactly a century later.

During the first three plans over 30% of the plan allocations of Himachal were diverted towards road construction. The road mileage is as follows :

TABLE 8

Himachal Roads (as on 31-3-69)

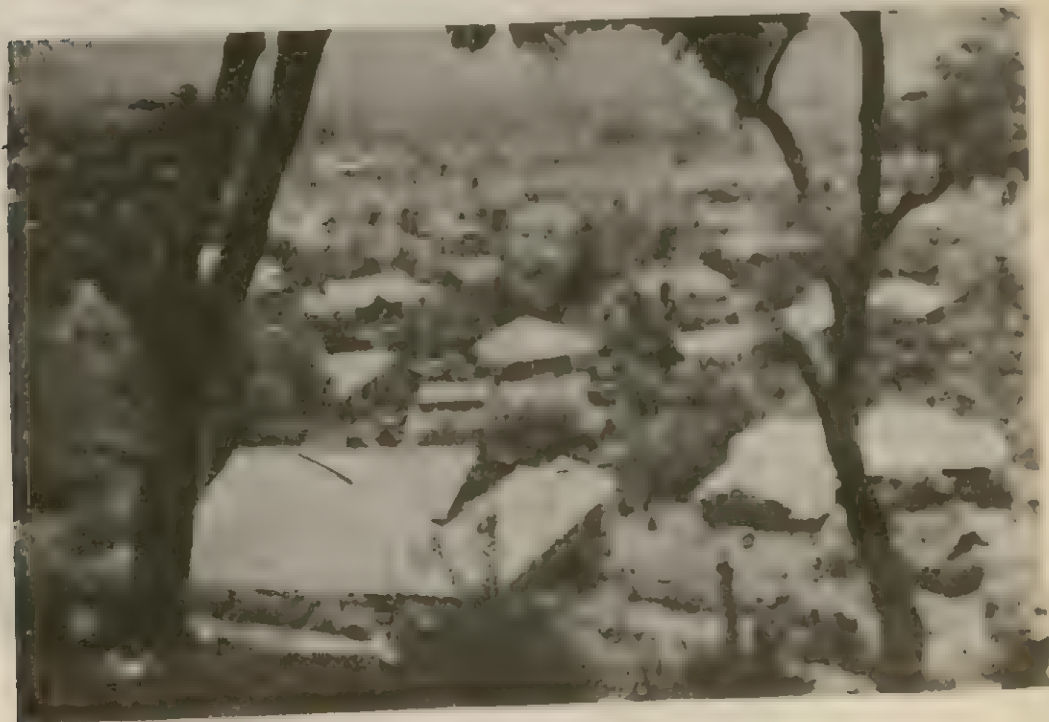
1. Surfaced motorable roads	1,264 km
2. Unsurfaced roads	2,888 km
3. Total motorable roads	4,152 km
4. Jeepable roads	475 km
5. Tracks	1,770 km

Strained relations with China produced a new awareness for the rapid construction of roads for strategic reasons. Since then a number of roads were strengthened to meet the requirements of defence for plying of heavy military vehicles besides undertaking construction of other vital links. The State Government gave top priority to link district headquarters. The roads first completed were Simla-Mandi road via Bilaspur, Simla-Nahan-Dehra Dun road and Hindustan-Tibet road which is now named as National Highway 22. The construction of N.H. 22 was most difficult as the alignment lies along steep rocky gorges. Over a hundred workers lost their lives in doing this risky job and the government in appreciation of their sacrifice has constructed a memorial for them at Jeori. Even after paying so much attention to roads in the plan periods there are only 8 km of road per 100 km² as compared with the All India average of about 25 km per 100 km². In order to achieve All India target, we have to add a kilometrage of nearly 10,000. Of the total roads, 3,716 km

PLATE VIII



A gaddi shepherd family of Chamba



Shyam Nagar (Dharamshala), Kangra Valley



A view of the Nainital lake



A view of Talli Tal, Naini Tal

ing to location, elevation and aspect which is further reflected in the variety of natural vegetation and cultivated crops. There are many and varied human adjustments to the mosaic of patterns in this hilly and mountainous region. The Great Himalayan range is very high, the peaks attaining to an altitude of 6,500 m and over and acts as a physical and climatic divide. To the east are rugged, drier and isolated tracts of Spiti and Kinnaur and to the west of the range are the more humid and hospitable areas. The bleak and barren Spiti tract stands in marked contrast to the beautiful and bounteous valleys of Kangra, Kulu and Chamba. Himachal is further divisible into a number of river basins. The water parting between one river basin and another forms a natural geographical boundary. The mountain ranges and ridges form natural divides, the crest line constituting the boundary line. The drainage basin of the river is a natural topographic unit. Herein the problems of land use, irrigation, floods, forests, hydroelectric power, water supply and communications are interrelated. The integrated measures are undertaken for the harmonious development of the entire river basin as it constitutes a manageable planning area. The rivers and their valleys have provided lines of movement for fostering commercial and social intercourse. Thus on the basis of physical climatic, economic and cultural consideration, the Himachal region has been divided into 2 first order regions, i.e., Himalayan Himachal and Trans-Himalayan Himachal. These have been further subdivided into 7 second order regions and 14 third order regions as follows (Fig. 9.26) :

16. *Himalayan Himachal*

(a) Chandra-Bhaga Basin

- (i) Lahaul
- (ii) Pangni

(b) Ravi Basin

- (i) Brahmaur region or Ravi Chamba-East Region.
- (ii) Chamba region or Ravi Chamba-west region.

(c) Beas Basin

- (i) Kulu-Banjar Region or Kulu-Beas Region
- (ii) Mandi-Beas Region
- (iii) Dera-Gopipur Beas Region.
- (iv) Kangra-Palam Region

(d) Himalayan-Sutlej Basin

- (i) Simla-Rampur Region
- (ii) Bilaspur-Nalagarh Region

(e) Yamuna Basin

- (i) Tons-Pabar Region
- (ii) Giri-Yamuna Region

17. *Trans-Himalayan Himachal* (Spiti-Kinnaur Himachal)

(f) Trans-Himalayan Sutlej Basin or Spiti-Sutlej Basin

- (i) Spiti Region
- (ii) Kalpa-Sutlej Region

(g) Malung valley.

The Himalayan Himachal : This region extends in elevation from about 300 m in the low *Dun* tract to over 6,500 m in the Great Himalayan range. The region is comparatively well-watered having numerous perennial rivers and streams, notably amongst which are the Chandra-Bhaga, the Ravi, the Beas, and the Yamuna. The rainfall ranges from 800 mm to over 3,000 mm. Almost all (over 98%) of the agricultural land, population, industry and communications are found in this tract. Out of the total population (2.8 million) of the Region only 46,000 is found in Trans-Himalayan Himachal. The Himalayan Himachal is rapidly developing since the formation of Himachal Pradesh. The important river basins offer a natural division of this region into five parts. (a) The Chandra-Bhaga Basin, (b) the Ravi Basin, (c) the Beas Basin, (d) the Himalayan Sutlej Basin, (e) the Yamuna Basin.

(a) *The Chandra-Bhaga Basin* : It comprises mostly of the tahsils of Lahaul (Lahaul-Spiti district) and Pangni (Chamba district) and lies between the Great Himalayan range and the Pir Panjal range. The Chandra-Bhaga basin covers an approximate area of 7,500 km². The area is secluded and mountainous having numerous glaciers and high passes. The rainfall is low and winters are severe. There is good deal of hydro-

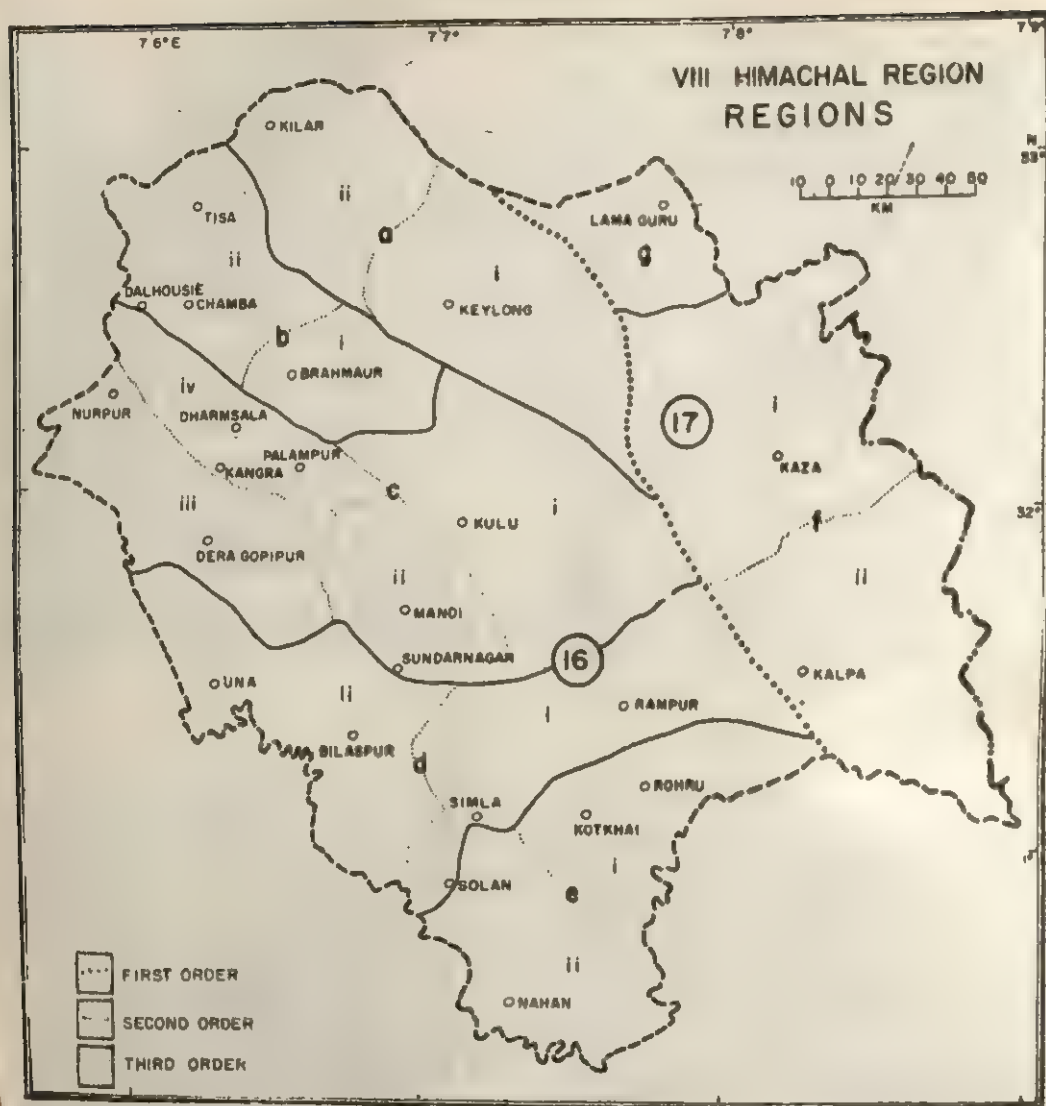


Fig. 9.26

electric potential (760 MW). Barely 0.2-0.3% of the area is cultivated. The region has remained since long under two administrative units, that of (i) Lahaul formerly in Kangra and now a part of new district of Lahaul and Spiti, and (ii) Pangi, a part of Chamba district.

Lahaul is situated at an average elevation of 3000 m. Since winters experience heavy snow-fall, only one crop during summer is possible. The light sandy loam soil near the river courses

is cultivated with the help of irrigation. The cultivated area is only about 15.3 km². Irrigation is essential in this region of low rainfall (Keylong 584 mm, most of which is received as snow during winter) for crops, for grasses and even for plantation of forests. The mountain meadows are used for grazing by transhumant flocks mostly from outside the region.

The people are peasants, pastoralists and traders as one occupation does not provide enough

sustenance. Lahaul has an important location for trade as it lies on routes to Kulu, Rupshu, Ladakh, Spiti and Tibet. Caravans across it carry *Pashmina* wool, *Kuth* etc. to Kulu and return with grain, sugar, kerosene oil etc. Since 1962, trade with Tibet has almost stopped causing some hardship. Formerly Lahaul formed part of Ladakh and in about A.D. 1700 it was made a part of Kulu Principality. The region is now being opened up because of its strategic location. A jeepable road across Rohtang Pass to Keylong has been developed and is being extended on the west to Kilar and on the east to Sumdo. Extension on Billing and Shansha micro-hydel schemes in Lahaul is being undertaken to increase their installed capacity. This will help lift-irrigation, small scale industries and solve the fuel problem. Buddhist way of life, high agricultural production due to irrigation, pastoralism, cottage crafts, trade and transport have been the salient features of this region.

Pangi is separated from Lahaul by a high spur from the Great Himalayan range between Thirot and Triloknath. It is separated from the rest of Chamba by the Pir Panjal. It has a density of 5 persons per km². This region is high and isolated. Numerous passes lead in and out of the Chandrabhaga valley, the most convenient route is through Sach Pass (4,358 m). Therefore summers are cool and winters are severe. Annual rainfall at Kilar is 535.2 mm and snow lies from October to April. Therefore passes are closed for 4-5 months in winter and even in summer there is comparatively little inter-communication. "So forbidding was considered this region in former times that every State official proceeding to Pangi on duty was granted a special allowance under the head of 'Funeral Expenses' as he was not expected to return." For the same reason Pangi was formerly made use of as place for banishment for criminals and political offenders. Pangi is unique in its grandeur and beauty. Nature appears in her wildest and grandest moods. The area therefore attracts the adventurous among tourists for mountaineering, trekking and for its big game. There are still a few virgin peaks (6,600 m). The people

begin to lay in a store of fodder, fuel and other provisions as winter approaches. During winter months they are confined to their houses. They employ themselves chiefly in wool spinning and rope making etc. or clearing snow off the roofs. Clothes and *thobis* are made and *pattu* is woven for sale or use. When spring sets in, earth is scattered to melt the remaining snow and to clear the ground for ploughing and sowing. Ploughing is done by *Churs* (crossbreed between cows and yaks). The crops are mainly wheat and barley with *phullan*, *bres*, *elo* and *masar*. Excepting certain favourable localities, there is as a rule one harvest in the year. Forests occur only along the banks of Chandrabhaga. Deodar and blue pine predominate. Edible pine (*Chilgoza*), *Tbangi* (hazelnut) and walnut grow wild. Walnut oil is used for burning and cooking purposes. The people drink a liquor made from *elo*, a kind of rye. Owing to scarcity of fodder in the villages, the cultivating families cannot keep large number of livestock. High pastures are, however, quite extensive. *Gahars* (high summer pastures) are visited by flocks of shepherds from the Ravi valley. There are only a few villages and the area is sparsely populated. River Chandrabhaga divides Pangi into two tracts, one on the left bank in which only a few villages are situated and the other on the right bank comprising most of the populated area with its pasturages. It has only 90 inhabited villages. Most of the people belong to scheduled castes and tribes. 7,734 are workers, out of which women constitute 3,582. Most of the workers are cultivators. Pangi exports *pattu*, *thobis*, *Zira* (cummin), *Kuth*, hazelnuts and *chilgoza*, and imports, salt, sugar, oil and some foodgrains. The southeastern part from Rauli to Thirot is known as Chamba Lahaul which is higher and even more inaccessible. Chamba Lahaul exports ponies and black cummin. Kilar (33°5' and 76°26' E) is headquarters of Pangi tahsil and is about 120 km from Chamba. It is famous for the temple of *Det Nag*. Mindhal on left bank of Chandrabhaga, is opposite to Sach temple of Chamunda (Mindhal *Basan Devi*). Triloknath (32°40'N and 76°41'E) temple in Chamba-Lahaul is famous. It

has image of Bodhi Sattva Triloknath. Pilgrims come from Tibet, Ladakh and other parts of India. It is a cultural transition zone of Hinduism and Buddhism. Beyond is Buddhist Lahaul, Ladakh and Tibet. Bardang (67 MW), Seli (133 MW) and Raoli (400 MW) hydel schemes on completion will supply hydroelectricity to the area.

(b) *The Ravi Basin* lies to the south of Chandra Bhaga Basin between the Pir Panjal and the Dhauladhar range. The total area of the basin is about 5,451 km². This basin is more humid than Chandrabhaga Basin but less than the Beas Basin. The area is largely mountainous except for the valley tract. The Basin is divided into two by Tundah Range and Chirchind Nala : (i) The Brahmour Region or Ravi Chamba East and (ii) Chamba Region or Ravi Chamba West. The eastern tract is more isolated, rugged and less developed than the western part.

The Brahmour region includes Brahmour proper (tahsil of Chamba) and Bara Bangahal tract of Kangra. The region is almost entirely inhabited by the Gaddis and is also popularly known as *Gadderan*. Brahmour proper has an area of about 1326.9 km² and population of 14,105 having a density of about 11 persons per km². The area is largely forested. The upper slopes have summer pastures. Gaddis of Brahmour keep large flocks of sheep and goats which constitute their chief wealth. Winters are severe and snow falls from November to March and passes are also closed during this period. It is customary for most of the villagers to migrate to lower valleys, some going to Chamba and others to Kangra. This custom is not found in any other part of Chamba district and is probably of ancient origin and the people speak of going to 'Jandar' as they call the country south of Dhauladhar. As a matter of fact the mountain habitat has strongly influenced their economy and society. The word 'Gaddi' itself means 'herder'. Migration along with the flocks of sheep and goats begins in November and return is in April or May. Some members of the village community remain at home and look after the cattle and property. But villages in this region are almost deserted

during winter. Gaddis combine pastoralism with agriculture. Land for cultivation is very much limited. However, relief is provided by extensive mountain pastures which make possible the maintenance of large flocks of sheep and goat. Maize, millets, wheat, barley, potatoes and pulses are grown but the area is so isolated that it is difficult to get in times of scarcity and sell in times of surplus. Walnut, peach, wild apricot and other similar fruits are common. Exports comprise wool, *pattus*, honey, *ghi*, rams, *kuth* and walnuts. Most of the population (25,625—1961) in Brahmour proper belongs to scheduled castes and tribes (24,153). Literacy is about 7% only. Only road link is to Chamba town. Brahmour (32° 26' N and 76° 32' E) in Budhil valley at a distance of 67 km from Chamba has been the ancient capital. The whole country around Brahmour is supposed to belong to Shiva and is called "Shiv Bhumi". Manimahesh lake situated in Bhandai valley at an approximate elevation of 3,930m attracts thousands of pilgrims every year for a dip in the sacred waters.

The Chamba region or Ravi Chamba West is the better known part of the Ravi Basin and is economically more developed. It includes the Chamba and Churah tahsils along with the recently accessioned Dalhousie tract. It has an area of about 2610 km² and a population of 138,456 (1961), giving a density of about 53 persons per km². Nearly 31% of the population comprises of scheduled castes and tribes. Only about 10% of the population is literate and 55% is classed as working population. The region is more devoted to arable farming. The annual rainfall at Chamba is only 1,303 mm. Rice is grown in irrigated fields but irrigation is limited (9.5% of agricultural area). Maize is the leading crop followed by wheat, barley, millets, pulses and rice. The farmers also keep livestock. In Churah which is mainly the basin of the Siul, a tributary of Ravi, failure of maize crop means famine. Poultry and livestock are also maintained. Chamba region exports walnuts, honey, *banafsa*, *kuth*, *ghi*, *phullian*, *suil*, quinseed, apples, cummin and *dhup* (incense). Chamba town (32° 33' N and 76° 8' E) situated at 915 m on the

right bank of Ravi on a high terrace is the regional as well as the district headquarters. It is also a route centre and staging house for journeys to Brahmour, Pangi, and Kangra. An excellent motor road connects it to Dalhousie (2036 m), a fine hill station on the Dhauladhar, and further the road extends to Pathankot.

(c) *The Beas Basin*: The region extends through the middle of the Himalayan Himachal and is thus the central region. It has about 37% of the area and about 53% of the population of the Himachal region. Economically also it is the heart of Himachal and includes the fertile well-watered valleys of Kangra and Kulu. Climate, as a whole, does not suffer from extremes. Most of the population is rural. 87% of the population depends on agriculture but the general percentage of cultivated land is only 19.5. The rest of the area is mostly forest or wasteland. Incidence of livestock on cultivated area is high. In Kangra and Palampur tahsils the irrigated area comprises 50% of the total. On the whole the irrigated area is 20%. Agriculture is largely subsistence type. 80.4% of the cultivators have holdings of less than 2½ acres. Farm income provides ½ to ⅔ of the total income. Nearly 1/3 of the towns of Himanchal Pradesh lie in this region. The Himalayan Beas Basin is the best served region of the Himachal from the point of view of transport and communications. The Beas Basin is subdivided into 4 sub-regions, i.e., (i) Kulu-Banjar region or Kulu Beas, (ii) Mandi Beas Region, (iii) Dera Gopipur Beas Region and (iv) Kangra -Palam Region.

The Kulu-Banjar region is largely a mountainous tract. Only less than 10% of the total area is under cultivation. The population is mainly dependent on agriculture. Wheat, maize and barley are the leading crops. Numerous valley areas as that of the Beas, the Parbati, the Sainj and the Tirthan are comparatively more developed than the rest of the area. The Kulu valley extending from Larji to Manali, owing to availability of good agricultural land and irrigation and fine climate, has remarkable concentration of population exhibiting a linear pattern. The area is famous for fruit cultivation, honey, and

Kulu shawls. Banjar is separated from the Sutlej basin by Jalori ridge and is connected by Mandi Kulu road; a route leads across the ridge to Rampur. Kulu has only about 4% urban population and 90% of the population is engaged in primary production. Kulu (pop. 4886) is the district headquarters and regional centre. It is an important trade-route centre and Kulu Dusserah fair is a religious-cum-trade fair. Manali is a well known tourist resort. The whole region has high potential for horticulture and tourism.

The Mandi Beas region includes practically the whole of Mandi district and enjoys a fairly central location in the Himachal Region. Nearly 20% of the total area is under cultivation though the percentage is higher in Mandi tahsil (about 33) and decreases in Sarkaghat and Chichot. Because of higher percentage of agricultural land the region is more densely populated than Kulu-Banjar region and carries a density of 92 per km². About 94% of the population is rural, and 89% is engaged in primary production. Wheat, maize, rice, millets and pulses are the leading crops in respective order. Where irrigation is available rice is grown, elsewhere maize is the leading Kharif crop. The rock salt mines of Guma are commercially exploited. Mandi (13,034) is the district and regional headquarters and is a centre of industry, trade and tourism. Sundarnagar (5,782) to the south of Mandi is another urban centre and was the capital of former Suket State. Jogindarnagar (2,719) is situated on a ridge and is important for the hydroelectric power house on river Uhl.

The Dera Gopipur Beas region includes most of the area of Nurpur, South Kangra and Palampur, Dera and Hamirpur tahsils. 600 m contour roughly delimits it in the north from Kangra-Palam region and Sola-Singhi range delimits it in the south from the Sutlej Basin. This region consists of low hills and uplands. Here the Beas flows in a deep course. The area is *barani*. Not more than 10-15% of the area is irrigated in Nurpur and in Dera and in Hamirpur it is even less. The agricultural area in this tract is quite high (between 30-40%) but yields are low. Nearly 2/3rd of the maize crop and

3/4th of the pulses of the Himalayan Beas Basin are produced in this tract. Wheat is an important Rabi crop. Farmers also keep large number of livestock. *Ghee* is exported. Nearly 80% of the population is agricultural, but agriculture does not provide sufficient income and people are compelled to tap other sources of livelihood elsewhere, particularly in defence services. Nurpur (3,405) is the only town in the region. Roads have been extended to Hoshiarpur, Mandi and Nangal, and a very significant and useful provision in the region is the construction of road bridge on the river Beas at Dera Gopipur. It now provides through traffic all the year round. The route has a strategic significance also.

The Kangra-Palam or Northern Region includes the northern tracts of tahsils of Nurpur, Bhattiyat, Kangra and Palampur. About 20% of the area is under cultivation. The northern portion is mountainous and is mostly covered by forests and pastures. Agriculture is carried on in favourable patches and large flocks of sheep and goats are kept. Maize, potatoe, barley and pulses are important. The lower tract is gently undulating and well irrigated. Here 40-50% of the cultivated areas is irrigated. Soils are fertile and rainfall is plentiful. Perhaps no other region presents anything more beautiful than the Kangra-Palam region exhibiting a scenery of wood, water, pretty farmsteads and care-displaying mosaic of innumerable fields. The region is the best agricultural area in the Himalayan Beas Basin. It has the best agricultural land, the best irrigational facilities and the best communications and market centres. It is the most important rice (nearly 50%) and tea (90%) producing area. In addition, it produces large quantities of maize, oil-seeds, pulses, sugarcane, spices and potatoes. Nearly 25% of the wheat is also produced here. Agricultural density in Kangra and Palampur tahsils is as high as 785 and 841 per cultivated km². There are a few agro-based industries here. It is also the most urbanized tract containing 3 out of 10 urban centres of the Himalayan Beas Basin. Kangra (5,775) and Palampur (6,116) are the two regional focii, though Dharamsala (10,255) and Yol (10,292)

are bigger towns.

(d) *The Himalayan Sutlej Basin* : A transverse ridge from the Great Himalayan Range extending westwards to Simla, Solan and Dagshai separates the Sutlej Basin from that of the Yamuna Basin to the south. The region is important from the point of view of horticulture, tourism, trade and commerce. Well-known Bhakra Dam and National Highway (no: 22) lie in this region. The region is subdivided into two, roughly by contour of 1200 m : (i) Simla-Rampur Region and (ii) Bilaspur-Nalagarh Region

The Simla-Rampur region is economically a very significant region in the Himalayan Sutlej Basin. The area has extensive apple and potatoe growing tract extending from Simla to Kotgarh and Rampur. 3/4th of the population of Kotgarh is engaged in apple growing, packaging and transporting.⁴⁵ An important subsidiary industry is the manufacture of wooden cases for apples. The affluence which apples have brought is reflected in the rise in the standards of living. Wheat (34.3%) is the first order crop in the region followed by maize (29.3%), barley (8.4%), millets, pulses etc. Irrigation is limited to only 6.8% of the agricultural area. As the area becomes more mountainous and remote to the east, the general density decreases from 137 in Simla to 61 in Mahasu. Simla (42,597) is the capital town and regional centre. Sabathu (3,216), Solan (6,564), Kasauli (4,101), Dagshai (2,783), Kufri, Narkanda (360) and Rampur are some of the tourist and service centres. At Rampur is held the biggest trade fair of the hills in northern India known as 'Lavi' fair which is important for regional and inter-regional trade, and goods worth over a million rupees change hands during the three day fair.

Bilaspur-Nalagarh region is an area of lower hills. About 1/4th of the area is available for cultivation. Irrigation is limited to less than 7% of the area. Maize is the leading crop followed by wheat, gram, pulses and rice. Nearly 95% of the population is rural and about 81% of the workers are engaged in primary production. Bilaspur (7,424) is the regional centre. Nalagarh (3,216), Akri (1,221) and Una (5,166) are other

service centres. Naina Devi temple attracts thousands of pilgrims.

(e) *Yamuna Basin* : A small area of Yamuna Basin lies in Himachal Pradesh. Tons, Pabbar and Giri are main affluents of the Yamuna. The total catchment area is estimated at about 2,300 km². With the exception of Kiarda dun, the whole area is hilly. Agriculturally the region is more productive particularly in arable farming though in horticulture it is less developed than the Simla-Rampur region. The hydel power potential is estimated at 795.1 MW. The region is sub-divided into two (i) Tons-Pabbar region and (ii) Giri-Yamuna region by a high ridge between the Tons and the Giri culminating in 3,647 m Chaur peak and running across to Simla.

The Tons-Pabbar region is more hilly than the Giri-Yamuna region. Agriculture is thus more restricted and 10-15% of the area is under cultivation. The rest of the area is under pastures and forests. Less than 10% of the agricultural area is irrigated. Wheat is the leading crop followed by maize, millets, barley and rice. Kotkhai and Jubbal areas are important for the production of fruits and potatoes. Rohru, Deorha, Kotkhai, Godna, Tharoch and Chaupal are the notable service centres. It has road connections to Simla, Rampur and Poanta. The region has cultural relations with Tehri-Garhwal Region of U. P. Himalaya.

The Giri-Yamuna region includes mostly the district of Sirmur and some parts of Simla and Mahasu. The valleys of Yamuna and Giri are more open and well-watered. About 21% of the agricultural area is irrigated. Wheat is the first order crop followed by maize, rice, gram, pulses and barley. Nearly 93% of the population is rural. Forest produce, such as timber and resin, are important. There is considerable export of wool and forest produce. State quarries are worked in Pachhad and Renuka tahsils. There is rosin and turpentine factory at Nahan, and also a foundry which was started as far back as 1867. In addition, the development of Nahan ceramics, Nahan electricals, Nahan footwear and hosiery is notable. The Giri Multipurpose

project (total potential 202 MW) will provide cheap hydel power and irrigation facilities (24,282 hectares). The region has road connections with Dehra Dun, Ambala and Simla. Nahan (12,439) is the regional centre, the district headquarters of Sirmur and an important route centre. Poanta (1,833) at ferry-point on Yamuna is a religious centre. Other notable service centres are Dadahu, Sarahan, Rajban and Chail.

The Trans-Himalayan Himalachal : It comprises of (f) Trans-Himalayan Sutlej Basin and (g) Malung valley. Malung valley is separated from the southward flowing Spiti by a high spur (6,094m) from the Great Himalaya which extends eastwards to Zaskar range and forms a water divide between the Malung, the Chandra and the Spiti. The Trans-Himalayan Region is isolated, arid and bleak. Kalpa-Sutlej or Kinnaur in the south is comparatively less arid and more accessible and agriculturally more productive than Spiti or Malung valley. The region on the whole is sparsely populated. Cultivation is possible where irrigation is available. These areas are of high strategic importance being border areas.

The Trans-Himalayan Sutlej Basin : It includes the Spiti and Kinnaur. It is bifurcated into two subregions (i) Spiti and (ii) Kalpa-Sutlej or Kinnaur by a glacier garlanded spur crossed by Manirang pass (6,593 m).

The Spiti region is completely hemmed in by mountains. The mean elevation of Spiti valley is 3,900 m. Some villages are situated at even higher elevations. The villages stand for the most part on the terraces above the cliffs of Spiti river and the white houses dotted about among the green cultivated plots afford rare cases in the desert of stony debris which covers the mountain sides. There is practically no rain but in winter there is fairly heavy snowfall making the area unapproachable. Cultivated patches are found near *nalas* comprising only 0.1% of the total area. Mid-October to Mid-April are dead months and only one crop is possible. Barley is the main crop. Other crops are wheat, peas and mustard. People also keep yaks and sheep and some wool is available for making woollen cloth on handlooms. The institution of polyandry in these

areas of restricted agriculture is a social device aimed at population planning.

Spiti has a total population of 5,276 (1961) and an estimated area of 6,000 km². There are only 6 inhabited villages in Spiti with 1193 houses and 1208 households. Only 12% of the population is literate. Dankhar and Kaza are the main regional centres. Kaza is the tahsil headquarters also. Other centres are Kibar, Sumdo, Dutung, etc. Spiti is a most inaccessible part of India. The various passes to Spiti, Kanzam (4,551m), Hamta (2,477m) and Pin Parbati (4,802m) are open only for 3-4 months in a year. Trade and commerce are therefore highly restricted. This area has suffered due to loss of trade with Tibet. Imports are salt, tea, tobacco, cloth, oil, sugar, dyes, etc., and exports are wool and yak tails. Microhydel projects and rural electrification schemes will assist in the economic development of the region.

Kalpa-Sutlej or Kinnaur region lies between the Zaskar and the Great Himalayan range. The snowbound valleys of Baspa, Bhaba, Hangrang, Kalpa and areas of Athora-Bhish and Pandra-Bhish constitute Kinnaur region. The region is quite dry. Only about 1.2% of the area is under cultivation and 45.9% of this is irrigated. Millets and ragi (52.9%) are the leading crops followed by barley (23.3), wheat (12.7), pulses (2.4), etc. Livestock is taken to high summer pastures (4,200 m). All kinds of dry and temperate fruits and vegetables, such as *Chilgoza*, almond, walnut, chestnut, grapes, apricots, peaches and apples grow there. Honey, *jira*, *shilajit* and various herbs and drugs are also available. This dry zone presents a panorama which is different from the adjoining Simla-Rampur region. The area was isolated for centuries and was approachable by a mule road only, but now it has road up to Pooh which is linked up by NH-22. The region has high potential for tourism. It is ideal for skiing, fishing, big game hunting and mountaineering. Regulations however, require a permit for entry into this region. Total population is about 41,000 giving a density of only 6 persons per km². It is said that the present inhabitants of Kinnaur are the descendants of the Kinnars of

Mahabharata. Kalpa is the regional centre and district headquarters of Kinnaur. South of Kalpa, Peo is being developed as a planned township. Special attention for development to Kinnaur is being given because of its strategic importance.

The *Malung valley* lies to the east of Bara Lacha Pass (4,891 m) and north of Kanzam Pass (4,551 m) between the drainage basins of the Spiti and the Chandra. It includes a small part of Spiti and Lahaul tahsils. The Malung is the main stream of Tsarap Chu or Tsarap Lingti and further of the Zaskar river which joins Indus north of Nimu. The region is high, dry and desolate. Barley is the main crop. Yak and sheep are also kept in small numbers. The economy in general is like that of Spiti. There are routes through this region to Rupshu and Zaskar. The passes are open to animal transport for only 2-3 months in a year. Kilang, Sarchu and Lama Guru are some of the route centres with small habitations. Population is very sparse, with a density of 2 per km². The people are Buddhists.

Problems and Prospects

On account of border location and various other geographical and historical factors, the region has remained underdeveloped. The most striking feature of the economy is its virtual dependence on a single activity—agriculture. 83.4% of the working force is engaged in primary production. The high pressure of population on agricultural land, lack of secondary and tertiary sectors and inadequate transport systems are the main features of the regional economy. The strategy for development will have to be guided by the physico-economic conditions of the region. This calls for change in the land use pattern on scientifically and economically more remunerative lines and provision of electricity and adequate transport system. Of the various problems faced by Himachal that of soil erosion is quite acute. Immediate steps should be undertaken to increase the area under forests and to plant fringe forests along the river beds and the Gobindsagar, Uhl and other hydel project catchment areas. After determining the

carrying capacity of meadows and grasslands, the grazing policy should be clearly defined and enforced. The long range solution of fodder problem lies in reducing the number of livestock, improving their breed and increasing the productivity. It is estimated that in the Sutlej catchment region above Bhakra reservoir the livestock is ten times as many as can be supported by the available resources. Many of the problems of livestock breeding, fodder supply, control of diseases etc. can be studied and resolved if a Regional Research Institute for Himalayan Animal Husbandry is set up.

Nowhere else is a greater need than in this region for an integrated development of agriculture, horticulture, animal husbandry and forest resources by applying scientific techniques.

Through an intensive rural electrification programme, a stimulus to development of rural economy in the form of small-scale and cottage industries as well as breaking of the isolation of various regions by developing new routes of transportation, the Region will attain its goal to better way of life and to contribute its share to national economy.

In spite of considerable progress in the construction of roads the costs of transportation still add considerably to commodity prices. The key to the development of the entire region is the rapid construction of roads and provision of adequate transport system. A few link roads have been built but the concept of a lateral network has yet to take shape.

The Simla hills boasted of some of the finest English schools where children of the upper class from all over the country came to study but the Himachali children were kept uneducated. The literacy rate is still low and must be accelerated. Technical training facilities should be provided not only for industrial skills but also for improved agriculture and animal husbandry. The administration needs of hill areas need special attention and the creation of Hill Administrative Service is necessary to provide officers who are familiar with the special problems of the hills. The border areas of Lahul and Spiti and Kinnaur need special and sympathetic attention, but the

development should be such as not to lead to compulsive annihilation of the socio-economic mores of the people. Not only water and power have been gifted away but the problem of uprooted people due to construction of hydel projects has yet not been solved satisfactorily. Their rehabilitation in hot and dry Hissar and Rajasthan is no real solution.

The hydel power potential is very high and no less than that of Switzerland (7.1 mill. kw. 1962). The development of hydel and forest resources is estimated to contribute an annual income of about Rs. 1500 million. Negotiations have been completed for a multi-million newsprint factory in collaboration with Canadian Newsprint Company to produce 200 tonnes of newsprint a day. There is also scope for rayon grade pulp unit and for the production of bobbins, furniture, plywood and sports goods. As a matter of fact, industry has barely scratched the surface of Himachal's potential.

Two cement factories are proposed to be set up in public and private sectors at Poanta where extensive deposits of limestone and gypsum are available. There is plenty of scope for further development of tourism if proper infra-structure is provided. Despite some modern development, tranquility and spaciousness will remain with Himachal Pradesh for years to come. Himachal could treble its tourist population without over crowding its hills and dales. Baneological assessment and classification of mineral springs will add to their therapeutic value and economic potential as spas. Due to road breaches, non-availability of transport or bumper harvest, a good quantity of fruit remains unsold and therefore it is necessary to develop fruit and vegetable preservation industry and to provide cold storage facilities to avoid loss.

There is no doubt that given proper organisation, priorities and planning, the region has sufficient resources to make it viable and prosperous. Already per capita investment on development (Rs. 188) is about the highest in the country and per capita income is claimed to have risen significantly. Although much of the life of the region remains anchored in the past, its people are definitely beginning to think in modern terms.

The significance of vast opportunities that are now unfolding themselves before the people "offer a chance and a challenge for the people of Himachal Pradesh"⁴⁶

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U. P. HIMALAYA

10

The U. P. Himalaya, hereafter the Garhkum Himalaya ($29^{\circ}5'-31^{\circ}25' N$ and $77^{\circ}45'-81^{\circ}00' E$) is popularly known as Kumaon Himalaya. The Tons separates this region from Himachal Pradesh in the west and the Kali from Nepal in the east. Starting from the foothills in the south, the region extends up to the snow-clad peaks of

the Himadri, marking the Indo-Tibetan boundary. Administratively, Garhkum incorporates Uttarakhand division, Kumaon division (excluding Kichha and part of Haldwani tahsil) and Dehra Dun district of Meerut division (Fig. 10.1), covering about 46,485 km² with a population of about 2.7 million (1961).

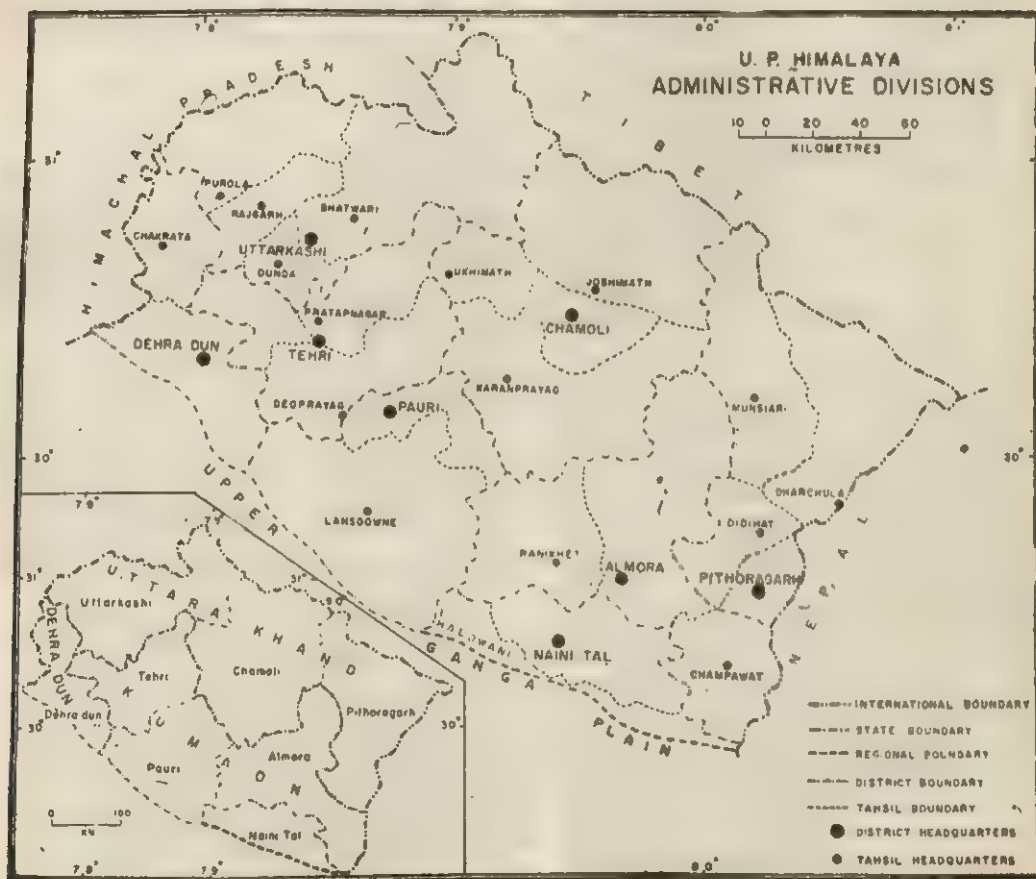


Fig. 10.1

The Garhkum Himalaya, being situated centrally in the long sweep of the Himalaya, forms a rather transitional zone between the Perhumid Eastern and the rather dry to sub-humid Western Himalaya. It looks like the crown of Uttar Pradesh and stands guard to the Upper Ganga Plain. Although culturally the region resembles the Himachal Himalaya, it has its own distinctiveness, reflecting the sublime blend of Indian cultural traits associated with the *Badrinath-Gangotri* complex which has absorbed the Mongoloid cults into Hindu moulds.

Historical Background

The name Kumaon is derived from *Kurmachal* (Kurma=tortoise, achal=mountain). According to *Skanda Purana*, God Vishnu assumed the Kurma or tortoise incarnation at Champawat in the Kali Valley. In the Pauranic literature, this region bears the name of *Uttar Khand* or *Kedar Khand*. Ved Vyas attached so much importance to it that he wrote an *Up-Purana* about it. It is because of this that the region is regarded as one of the holiest parts of Bharat, being frequented by great saints and kings from different parts of the country. Every rock and rivulet is dedicated to some deity or saint and has an appropriate legend attached to it.

Some of the Himalayan kingdoms such as *Dwigarta*, *Trigarta* and *Madra* flourished here. The region had also been under the kingdoms of Brahmapura and Shrugna, lying to the south-east and northwest of the Alaknanda respectively. The kingdoms of Madawat and Govisana were confined to the south of the Brahmapura covering the *bhcher* and *tarsi* region, as mentioned by Huen Tsang.¹ The region had also been a part of the Mauryan and Gupta empires. In the third century B. C., King Ashoka erected a rock-edict on the left bank of the Yamuna at Kalsi in the Chakrata tahsil of Dehra Dun. During the medieval period (around A.D. 17th century), a number of Rajput princes penetrated into the valleys of the Himalaya due to the confusion created by Muslim invaders and set up a number of small principalities. Many places have

been named after the regions from where they migrated, e.g., Ajmer Patti and Udaipur Patti.

Katyuris who are known to have a long dynasty lost their stronghold on Kumaon by about A. D. 1400² and split into scattered principalities. Champawat was the residence of the Chand rulers of Kumaon (A. D. 700-1790). In the middle of the sixteenth century, Rana Balo Kalyan Chand, a successor of the Chand dynasty, established his fort at Almora. Raja Udyot Chand was the last successful ruler of Kumaon, and after him the sovereignty of the kingdom under various Chand successors was gradually lost. In sixteenth century, Raja Ajaipl integrated the fifty-two fortresses (Garhs) and their associated territories into Garhwal (Fort—integrated territory). The Kiratas, Khasas, Seythians and Mongoloid elements have also contributed profusely to the culture-complex of the Garhkum Himalaya.

In A. D. 1743-44, there was a Rohilla invasion on Kumaon, but they could not establish their foothold. By early nineteenth century, the Gurkhas in their long sweep of invasion subdued Garhkum and the territories beyond up to Kangra. Their territorial ambitions brought them into conflict with the British. With the result, Nepal lost the territories of Kumaon and Garhwal in 1815. After the British occupation, Almora became the administrative seat of Kumaon and Garhwal. The residual state of Tehri was handed over to the Raja of Tehri by Britishers³ after retaining the most populous parts of Garhwal. During this period there was development of roads, railway lines, education, agriculture and commerce. The latest political boundaries have been made after the reorganisation of the districts in the hill-region of Uttar Pradesh in 1960.

The Bhotiyas of the Bhot region comprising five Himadri valleys bordering Tibet form one of the ancient cultural groups of the region. They are locally known as *Shankas* and perhaps are one of the successors of the *Sakas*, the ancient tribe of Central Asia.⁴ The nuclei of the Bhot culture were Mana on the Kishnaganga, Niti on the Dhaul (Western), Johar on the Gori, Darma on the Dhaul (Eastern) and Byans on the Kali. They have developed their own trade routes

connecting the great plains with Tibet. From the Tibetan side Khampas (Lamas or Huniyas,⁵ winter migrants) reciprocated and settled here in the higher valleys. The important passes through which the trades of the Bhotiyas and khampas are practised are Mana (5,611 m), Niti (5,068 m), Shalshal (4,496 m), Kungribingri (5,578 m), Lampya (5,532 m) and Lipulekh (5,453 m).

There has been a marked regional disparity between Garhwal and Kumaon cultures. The cultural, social and economic set up of Kumaon has been of a higher level in comparison to that of Garhwal. Comparatively gentler topography of the Kumaon region, rich agricultural land, its location along the early trade routes of the Bhotiyas, negotiating between India and Tibet, free access from all the sides, and early political awakening, all these factors have been responsible for the development of the Kumaon region.

The Physical Setting

The topography of the Great Himalaya (Himadri) is highly rugged and difficult with precipitous slopes. Horned peaks, serrated crests of high ridges, cirques and glaciers, snow-clad slopes, hanging valleys, cascades of sparkling water coming from melting ice, torrential rapids, and gigantic escarpments comprise a gorgeous topography. Deep canyons, roaring streamlets, huge boulders and glistening lakes present a beautiful scenery. The region has its own unsurpassable grace and charm, with the sweet melodies of beautiful birds of variegated hues, magical beauty of the enchanting flowers donating liberally their exuberant fragrance to the breeze.⁶

Geology

Although the geological investigations have been made in many parts of the Himalayan mountain, its large tracts are still lying unexplored. As is evident from the various studies,⁷ the region falls into three broad stratigraphical zones : (i) Outer or Sub-Himalayan zone, composed of sediments mostly of Tertiary age, (ii) Central or Lower Himalayan zone, composed of granite and other crystalline rocks of unfossiliferous sediments, and (iii) Higher Himalayan zone, com-

posed of a series of highly fossiliferous sediments. (Fig. 10.2).

Sub-Himalayan Zone : The foot-hill belt of the region is built entirely of Siwalik sediments. The Siwaliks constitute a great thickness of detrital rocks, clays and conglomerates, measuring between 5,000 and 5,500 m. These beds of sandstone and shale (Nahan) are separated from the Eocene beds of the Lower Himalaya by the 'Great Boundary Fault'. The beds dip towards the northwest at varying angles from 30° to 70°. The shales are variegated with violet, pink, red and green colours. The Siwaliks are generally subdivided into three series : Lower, Middle and Upper.

Lower Himalayan Zone : The Eocene beds of the Lower Himalaya have been separated from Lower Siwaliks (Nahan) by a great thrust known as 'Main Boundary Fault'. This great thrust line measures the whole length of the Himalaya right from Assam to the Beas, demarcating the northern boundary of the Siwaliks.⁸ The main structural features of this zone are (i) Krol belt, (ii) Deoban-Tejam belt and (iii) Almora-Dudatoli crystalline thrust sheet.

The Krol belt, named after the Krol mountain in Simla stretches from the Simla region in the northwest to Naini Tal in the Southeast. The overlying deposits of the Krol belt⁹ consist of the (i) Infra Krol, (ii) Krol sandstones, (iii) Krol limestones and (iv) Tal quartzites. This Krol thrust overrides a structural and erosional gap in the Siwaliks.¹⁰ This superimposition of relief may be compared with the northern margin of the Alps of Europe. The region southeast of Naini Tal has been made extremely complicated by crushing, crumpling and numerous local faults of different direction. Thus, the region is full of tectonic complications with tectonic slips and mass gliding.¹¹

The inner sedimentary zone of the Lower Himalaya is separated by the Almora-Dudatoli thrust sheet which lies north of the Krol thrust of Naini Tal. The sedimentary belt of Deoban-Tejam, following south of the main thrust of the Higher Himalaya, stretches from the Simla area in the northwest to the Kali valley in the south-

tectonic feature. The 'Main Central Thrust' is well outlined in the Kali gorge and the valleys of the Goriganga and the Pindar rivers. The main rocks of this zone are quartzites, migmatites, gneiss, garnet-schists, dioritic amphibolites, etc.

Major Physiographic Regions

The physiographic map and terrain profiles (Figs. 10.3 a & b) reveal the general physiographic characteristics of the region. The main ranges are aligned in NW-SE direction. The asymmetrical slopes, i.e., steeper along the southern side and gentler along the northern one, form the characteristic features of the region. The Ganga, the Yamuna and the Kali are the three major river systems.

On the basis of the physiographic attributes such as absolute and relative reliefs, the region may be grouped into the following major physiographic regions :

1. Himadri (Greater Himalaya)
 - (i) Himadri Ranges
 - (ii) Himadri Valleys
2. Himanchal (Lower Himalaya)
 - (i) Himanchal Ranges and Hills
 - (ii) Himanchal Valleys and Lake Basins
3. Siwaliks (Sub-Himalayan Tract)
 - (i) Duns
 - (ii) Siwalik Ranges.

The Himadri, the Great Himalayan zone is about 50 km in width. The mean relief averages between 4,800 m and 6,000 m culminating in the

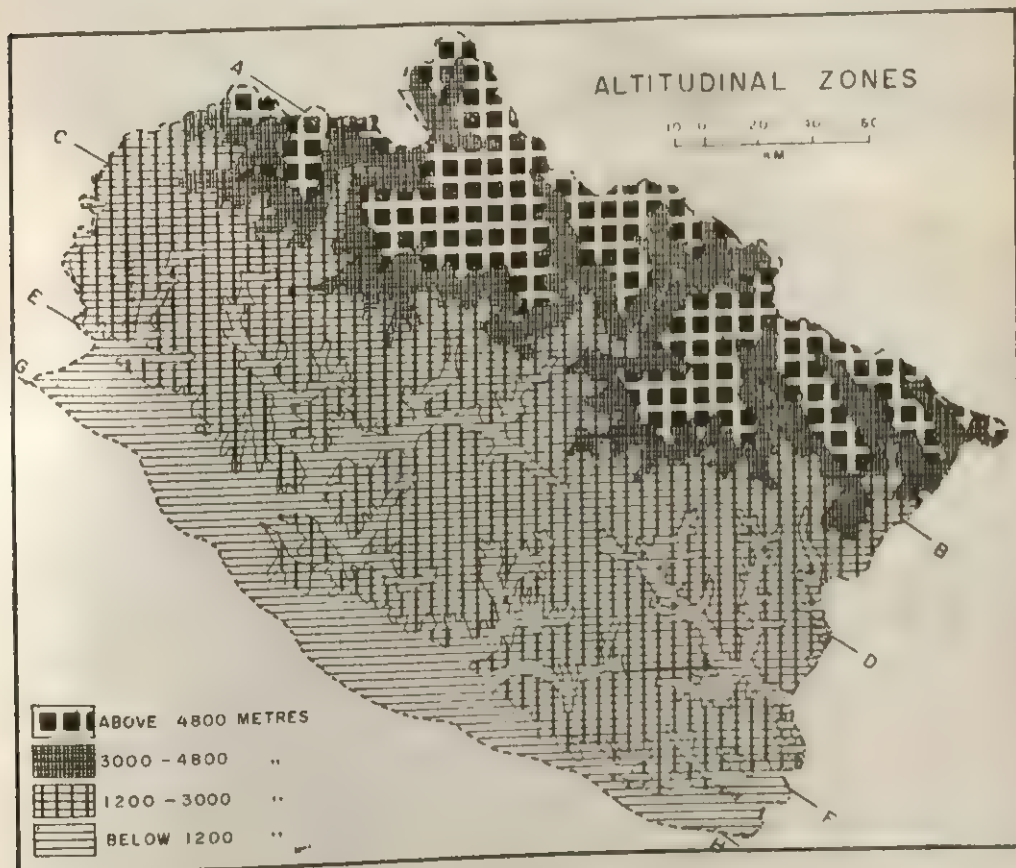


Fig. 10.3a

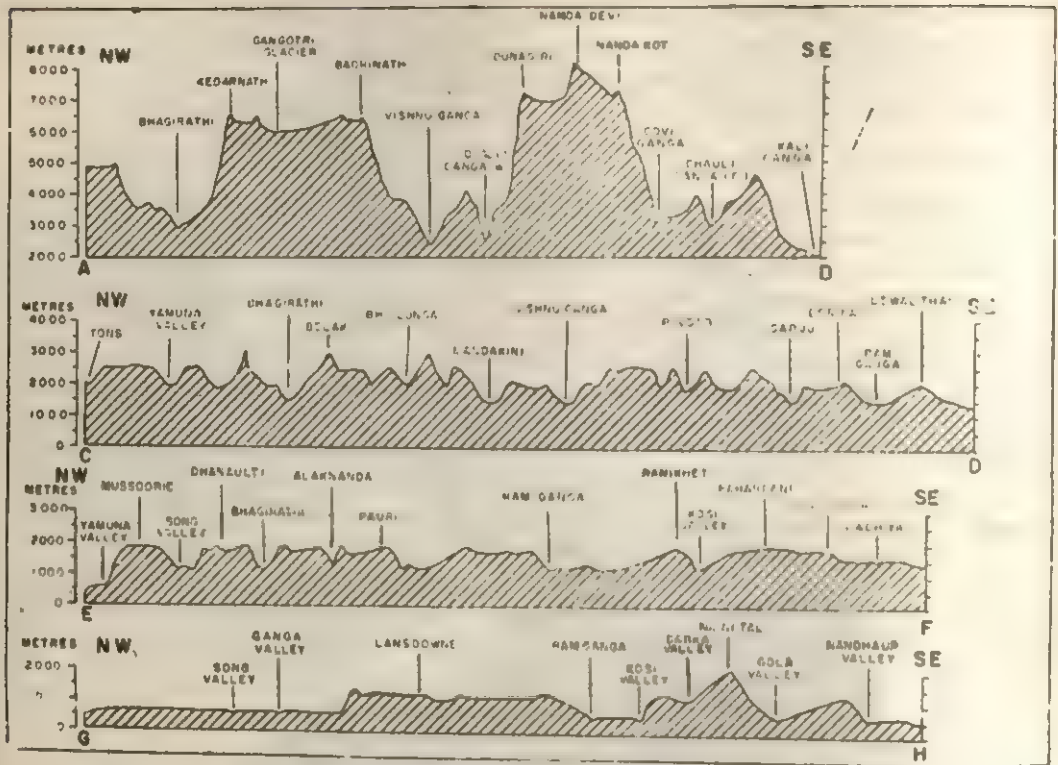


Fig. 10.3b

peaks of Nanda Devi (7,817 m) and Kamet (7,756 m). This zone consists of magnificent series of glacier-garlanded peaks : (i) Bandar Punch (6,315 m), (ii) Gangotri (6,614m), Kedar-nath (6,940 m), Chaukhamba (7,138 m), (iii) Kamet (7,756 m), (iv) Nanda Devi (7,817 m), Dunagiri (7,066 m), Trisul (7,120 m), Nanda kot (6,861 m). These four groups of peaks have been separated by transverse gorges of the Bhagirathi, Alaknanda and the Dhaul Ganga. The cross profiles of these valleys show convex form with steep valley-walls reflecting the rising phase of the Himalaya and also the younger characteristics of the rivers (Fig. 10.4).

With an approximate width of 75 km the Him-manchal is a massive mountainous tract and is separated from the Dun by the main Boundary Thrust. The ranges are mainly composed of highly compressed and altered rocks varying in age from the Algonkian to the Eocene. The

whole zone is a tangled mass of series of ridges being divided from each other by deep valleys. The average relief of ridges in this zone ranges between 1,500 and 2,700 m and of valley bottoms between 500 and 1,200 m. The cross profiles of these valleys generally show convex form with steep valley walls (Fig. 10.3 b).

The lake region of Kumaon has its own characteristic features. These lake basins are roughly confined to a belt of approximately 25 km length and 4 km width near the outer fringe of the Lesser Himalaya in the district of Naini Tal. Apart from the Naini Tal lake basin, a group of lakes comprising the Bhim Tal, Naukuchiya Tal, Sat Tal, Puna Tal, etc. lies to the east of the Naini Tal lake, forming considerably low-lying open lake basins. The lake basins of the Khurpa Tal, Sukha Tal and Saria Tal are very small in their extension. In the Garhwal Himalaya the Gohna lake is most important in the valley of Birahi

PLATE IX



A view of Kosi river valley, Almora



A view of Ramganga at Thal, Pithoragarh



A typical Naga house



The forest wealth of Naga Land

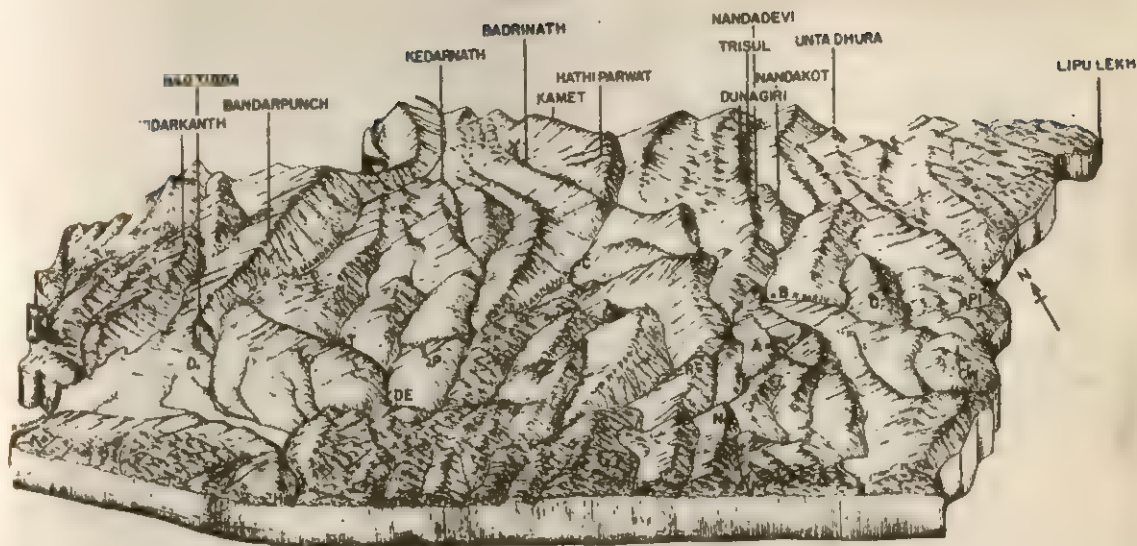


Fig. 10.4 : (Looking north) : D, Dehra Dun; U, Uttarakashi; T, Tehri; H, Hardwar; DE, Devprayag; P, Pauri; C, Chamoli; R, Ranikhet; N, Naini Tal; K, Kathgodam; A, Almora; B, Bageshwar; G, Gangolihat; PI, Pithoragarh; L, Lohaghat; Cw. Champawat.

Ganga, a tributary of the Alaknanda. Another important lake is Diuri Tal which lies ten km to the northeast of Ukhimath.

A long chain of narrow and low hills, stretching in NW-SE direction, lies almost parallel to the major ranges of the Himanchal and thus, forms the outer range of the Himalayan system. These ranges (also known as the Siwaliks) have been separated from the main Himalayan ranges by the Main Boundary Thrust. Lithologically, these ranges are quite different from those of the Lower Himalaya. The Siwaliks have a remarkable even crest between 750-1,200 m and are profusely forested on the northern slopes. On the southern slope they have steep scarps while on the north they descend gently to flat-floored structural valleys called *duns*.

The *duns* have been filled up by recent gravels derived from the Himanchal up to a height of 350 m above the plains. Out of the *duns* of Dehra, Kohtri, Chaukhamba, Patti and Kota, Dehra *dun* is the biggest and most well-developed.

It is about 35 km long and 25 km wide. It rises from 360 m along the Yamuna and the Ganga to 660 m in the middle and to 900 m near the foot hills.

Drainage

The region is well-drained by numerous rivers and rivulets (locally known as *gad* and *Gadhera*). Besides, lakes or *tals* of various shapes and sizes are important water features of the region (Fig. 10.5). The drainage can be divided into three main systems : 1. The Ganga System, 2. The Yamuna System, 3. The Kali System.

Major part of the region is drained by the Ganga system covering the whole of Garhwal except western part of Uttarakashi district and western parts of Almora and Naini Tal districts. All the main rivers of Garhwal have a peculiar tendency to flow for some distances in structural troughs parallel to the mountains, but sooner or later they take an acute bend to flow in deep transverse gorges, at places hundreds of metres,

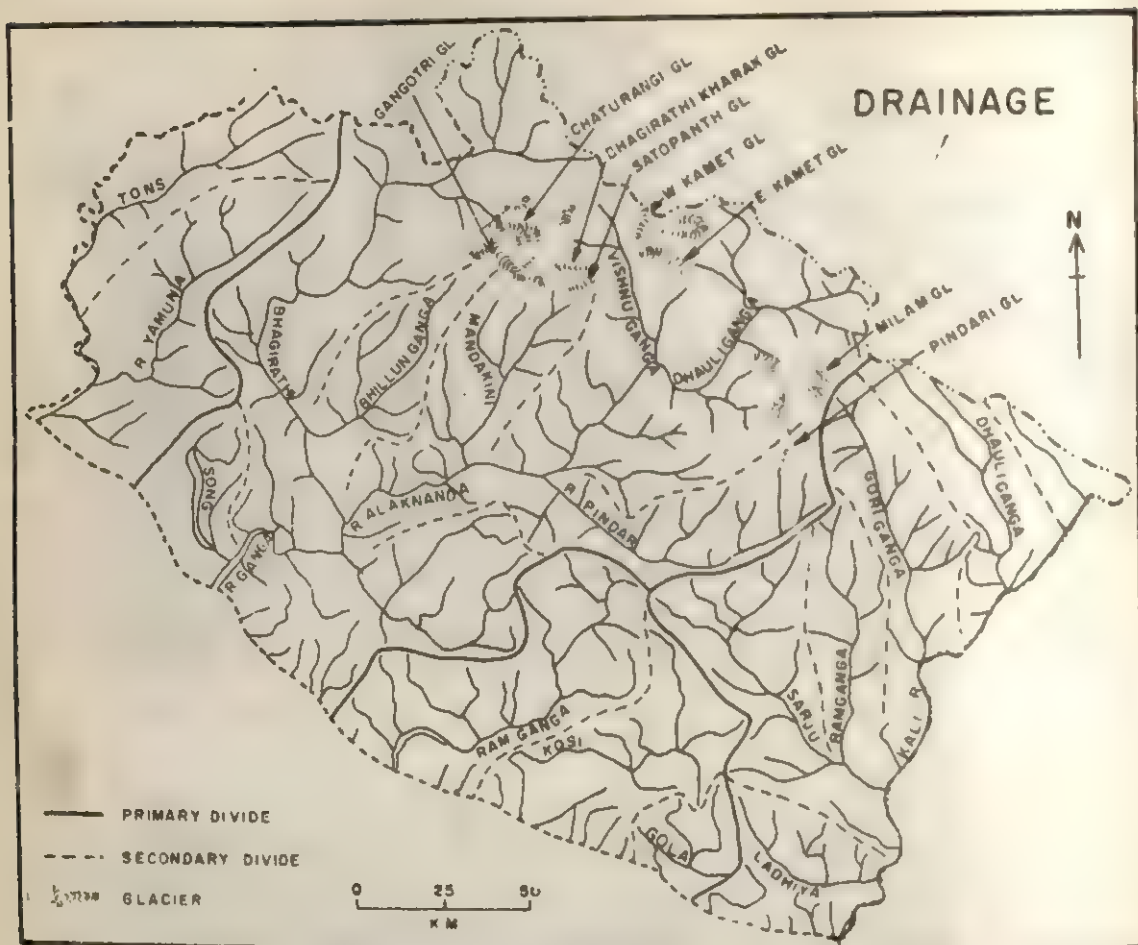


Fig. 10.5

in depth. The Bhagirathi and the Alaknanda originate from the opposite sides of the Chaukhamba peaks (7,138 m). After flowing in opposite directions longitudinally, they bend at Devprayag, thus taking a garland shape. The Bhagirathi and the Janhavi have cut awe-inspiring gorges through tourmaline granites constituting the central axis of the Himalaya.

Bhagirathi-Alaknanda Basin : Below Devprayag where the Bhagirathi and the Alaknanda meet, the river acquires the name of 'Ganga'. It emerges from the Himanchal at Lachhman Jhula, flows through the *doon* and cuts across the Siwalik range at Hardwar. The Alaknanda is the main tributary of the Bhagirathi. Other important

tributaries of the Alaknanda are the Mandakini, the Pindar and the Dhawal Ganga which meet the main stream at Rudraprayag, Karnaprayag and Vishnuprayag respectively.

Yamuna-Tons Basin : The Yamuna has its source in the Yamunotri glacier lying on the southwestern slope of the Bandar Punch peak. The Tons, the biggest tributary of the Yamuna, takes its rise from the northern slope of the Bandar Punch peak, and flowing in a valley northwest of the Yamuna joins the latter below Kalsi. It brings nearly double the volume of water of the Yamuna.

Kali System : About one-fourth of the region is drained by the Kali System covering the district of Pithoragarh and the eastern parts of the

Almora and Naini Tal districts. The Kali has two headwaters, i.e., (i) the Kalapani and (ii) the Kuthi Yankti. The Kalapani, the eastern headwater, is a collection of springs. The Kuthi Yankti, the western headwaters of the Kali, rises from the snow-fields of the Himadri. After the confluence the Kali flows in a southwesterly direction up to 120 km where the Gori Ganga meets it at Jauljibi. The Sarju, a greater feeder of the Kali, meets it at Pancheshwar about 45 km below Jauljibi. Other important tributaries of the Kali joining down-stream are the Lohawati and the Ladhiya. The Kali enters the plains at Baramdeo, henceforth known as the Sarda.

The Ram Ganga, the Kosi and the Gola are other important rivers in the eastern part of the

region. The Song, the Khoh, the Dabka, the Nihal, the Bhakra and the Nandhaur are the main Siwalik rivers, draining outer ranges of the region.

The rivers have formed deep valleys sometimes narrow and sometimes broad in accordance with lithology. In general, the dendritic pattern is most common. Local radial pattern has developed around the hills and peaks. Trellis drainage is to be found in the areas of thrusts and local faults where main streams have their subsequent affluents at right angles.

All the main rivers make a steep descent in the first ten or twenty kilometers of their longitudinal profiles and afterwards their gradient is not so steep, as is clear from the table below :

TABLE 1

Name of the rivers	From	To	Distance in km	Total fall in m	Rate of fall in m/km
Mandakini	Kedarnath	Gauri Kund	14	1591	113.6
	Gauri Kund	Rudraprayag	70	1363	19.5
Alaknanda	Badrinath	Vishnuprayag	38	1818	47.8
	Vishnuprayag	Rudraprayag	117	600	5.1
	Rudraprayag	Rishikesh	141	270	1.9
Bhagirathi	Gaumukh	Harsil	43	1445	33.6
	Harsil	Dharasu	104	1394	13.4
	Dharasu	Rishikesh	122	690	5.6
Gori Ganga	Unta Dhura	Milam	9	1200	113.3
	Milam	Lilam	38	2100	55.3
	Lilam	Jauljibi	262	900	34.3
	Jhundi	Loharkhet	9	600	66.6
Sarju	Loharkhet	Pancheshwar	202	1070	5.3
	Lipulekh	Garbyang	13	1500	115.4
Kali	Garbyang	Dharchula	77	1800	23.4
	Dharchula	Tanakpur	154	620	4.0

Out of the six rivers, the Mandakini, the Gori Ganga and the Kali have steep gradient in their upper courses.

Glaciation : The present land forms in the Himalaya show evidences of ice-sculpture result-

ing from the past gigantic glaciers. The present glaciation is but a shadow of what it was during the Ice-Ages. The glaciers in the larger valleys, such as the Milam, the Alaknanda and the Bhagirathi which are overlain with detritus for se-

veral kilometers (5 to 15), float, so to speak, on their moraines, which they are no longer capable of sweeping away. Generally, all the Himalayan valleys between 2,000 and 3,000 m depict glacial features wherever they have not been completely obliterated by fluvial action. Glacial topography is well-preserved above an elevation of 3,000 m in general. Near the snouts of these glaciers and for a few kilometers downstream, huge U-shaped valleys are found. Horned peaks are formed by excessive frost shattering. The Shivering and the Neelkanth peaks are far more impressive than the Matterhorn. Glacial lakes are formed by plugging of valleys by moraines, deposited by ancient giant glaciers. The Hemkund in the Bhyundhar valley, the Rupkund on the outer slopes of Nanda Ghunti, the Vasuki Tal and the Chorabari Tal above Kedarnath, the Satopanth Tal below Chaukhamba are some of the important examples.

The Gangotri glacier starts from the western slopes of the Chaukhamba peaks. It is 30 km long and about 2 km wide. The glacier is fed by a system of tributary glaciers known as Rakta Varna, Sweet Varna, Nilambar, Pilapani and Chaturangi, depending upon the colour of the surrounding rocks. Meaningful Sanskrit names are a glorious monument of the adventurous spirit of the ancient sages who explored and named these peaks and glaciers thousands of years ago. Broad glacial terraces are found at Tapovan and Nandanvan, 5 and 7 Km upstreams from Gomukh. Old lateral moraines are found above the glaciers at a height of about 200 m from which huge boulders and pebbles roll down casually. The Gomukh, the snout, is a grey blue wall, more than 100 m high. The ice cave through which the waters of the Bhagirathi pour out, has been changing positions frequently. Melted water percolates through the crevasses and forms an undercurrent below the glacier, flowing through an ice tunnel. Below the snout, for a few kilometers, there are a series of recessional moraines. Between the Gangotri and the Bhojwara, the last remains of boulder clay stand in the form of pillars topped by huge boulders. They are about 50 m tall. From the Gomukh to the Gangotri temple,

the valley of the Bhagirathi is wide and U-shaped.

Other important glaciers of the region are the Milam, the Lindari, the Poting, the Shankalpa, the Sona, the Raulphee, the Gunna, the Baling, etc. All these glaciers are located in the northern part of Pithoragarh district (Fig. 10.5)

Lacustrine Basins and River Terraces : In a number of places are found flat basins formed by ancient lake bottoms which were formed by the rise of the Middle Himalayan ranges. In due course of time, rivers cut through the obstructions to drain out these lakes. Such basins occur in the Kamola valley (a tributary of the Yamuna), around Baijnath in the Garur Valley (north of Kausani in Almora) and around the basins of Bhim Tal and Naukuchiya Tal in Naini Tal district. A pair of such basins occur in the Bhagirathi valley at Dharali and Jhala¹³.

The Himalayan Valleys have undergone intermittent upheavals, and each upheaval has caused a rejuvenation of the valleys. The evidence of recent rejuvenation, probably a consequence of uplift, is reflected by steepening of the transverse V-shaped valleys in many of the Himalayan rivers and also by river terraces, incised meanders and knick-points in the form of water falls etc. Chhibber¹⁴ has recognised the continued deepening of incised meanders of the Bhagirathi between Tehri and Gangotri and also the terraces adjoining the Balia river, near Ranibagh about 3 km above Kathgodam. Extensive river terraces are found at Srinagar-Kirtinagar and Tehri-Chham. Three or four sets of terraces are quite obvious in the Alaknanda valley. Beautiful incised meanders occur at Bachel Khali and Bhalidiana.

Climate

So far, there has been no systematic survey of the climate of the Himalayan region. Owing to its complicated relief, microclimates are of considerable importance. In the summer months, the valleys experience hot steamy tropical climate, while at a distance of about 75 km, the great range bears some of the highest snow-fields

of the world. Valley winds in narrow valleys and heavy fog during winter in wide valleys are conspicuous features of the weather of this region. The precipitation of every locality is directly related not only to the altitudinal zone in which it exists, but also to its situation in the front or the rear of a ridge or overlapping spur (Table 2).

TABLE 2

Stations in the Interior			Stations on the Edge		
Station	Altitude in m	Rainfall in cm	Station	Altitude in m	Rainfall in cm
Tehri	778	80	Narendranagar	1080	318
Deoprayag	457	70	Kotdwara	396	180
Karanaprayag	884	136	Dehra Dun	682	212
Srinagar	550	93	Rajpur	975	298
Pithoragarh	1636	122	Naini Tal	1934	270
Almora	1676	104			

The monsoon commences towards the end of June and ceases by the middle of September. Winter depressions cause snow fall for seven to eight days in each of the three months from January to March. April and May are rather marked by thunder and occasional hailstorms. In May and the first half of June, before the break of the monsoon, convectional rain occurs in the afternoon, in small amounts (12 to 25 mm) practically every third and fourth day often at high elevations. The zone of maximum precipitation, both summer and winter, lies between 1,200 and 2,100 m (Fig. 10.6). The zone above 2,400 m experiences much lesser amount of summer rainfall. There are marked differences in the amount of rainfall

in the front and rear of the main range. It is on account of these two reasons that Niti, located beyond the snow-clad peaks, gets only 14 cm of rain during the summer period.¹⁵ In general, the rainfall averages between 37-50 cm from June to September in the frontal zone, and 20-25 cm in the rear. Winter depressions cause three to five metres of snow fall from November to May.

The micro-climatic conditions usually differ from valley to valley and locality to locality according to the (i) the direction of ridges, (ii) degree of slope, (iii) sunny or shady aspects of slope, (iv) intensity of forest cover and (v) nearness to glaciers. The region can be divided into seven broad climatic zones, primarily based on altitude¹⁶:

TABLE 3

Climatic Zones	Altitude in metre	Temperature in °C					
		Mean	Annual	Mean	June	Mean	Jan.
Tropical Zone	300-900	18.9	21.1	27.2	29.4	11.1	13.3
Warm Temperate Zone	900-1800	13.9	18.9	21.1	27.2	6.1	11.1
Cool Temperate Zone	1800-2400	10.3	13.9	17.2	21.1	2.8	6.1
Cold Zone	2400-3000	4.5	10.3	13.3	17.2	1.7	2.8
Alpine Zone	3000-4000	3.0	4.5	5.6	13.3	Below Zero for 6 months	
Glacial Zone	4000-4800	Ten months below zero two months between 2.2 and 3.9				Snow melts in July and August.	
Perpetually Frozen Zone	Above 4800	Cold desert-no vegetation.					

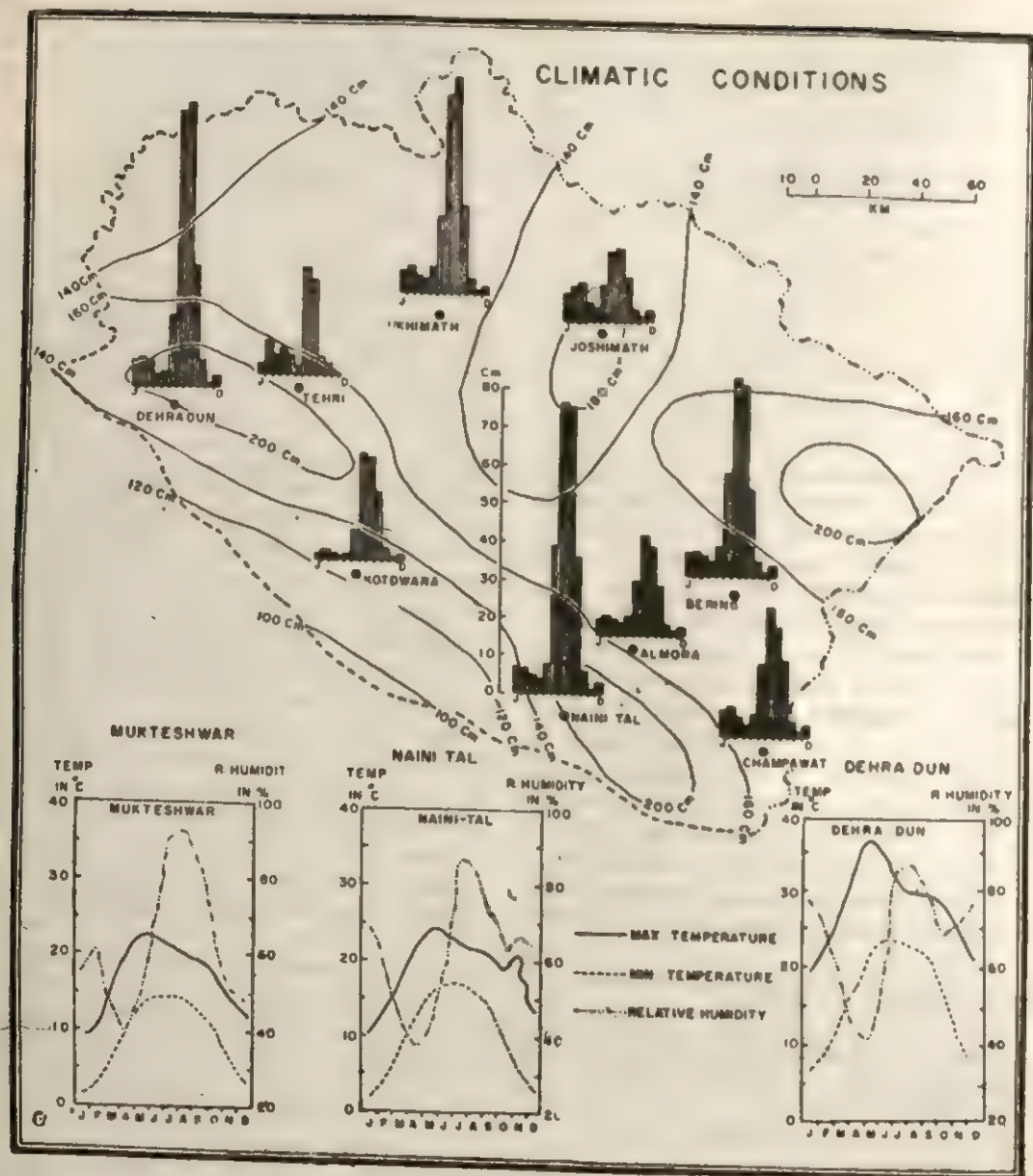


Fig. 10.6

Natural Vegetation

A major part of the region is covered with forests constituting enormous wealth of the region (Fig. 10.7). There are three main factors which determine the broad features of vegetation of the region : (i) atmospheric, (ii) edaphic,

and (iii) biotic. On the basis of the limited studies made so far it is possible to distinguish, in general, four main zones as follows (Fig. 10.7) : 1. Sub-Tropical zone (below 1,200 m), 2. Temperate zone (1,200-1,800 m), 3. Sub-Alpine zone (1,800-3,000 m) and 4. Alpine zone (3,000-4,500 m).

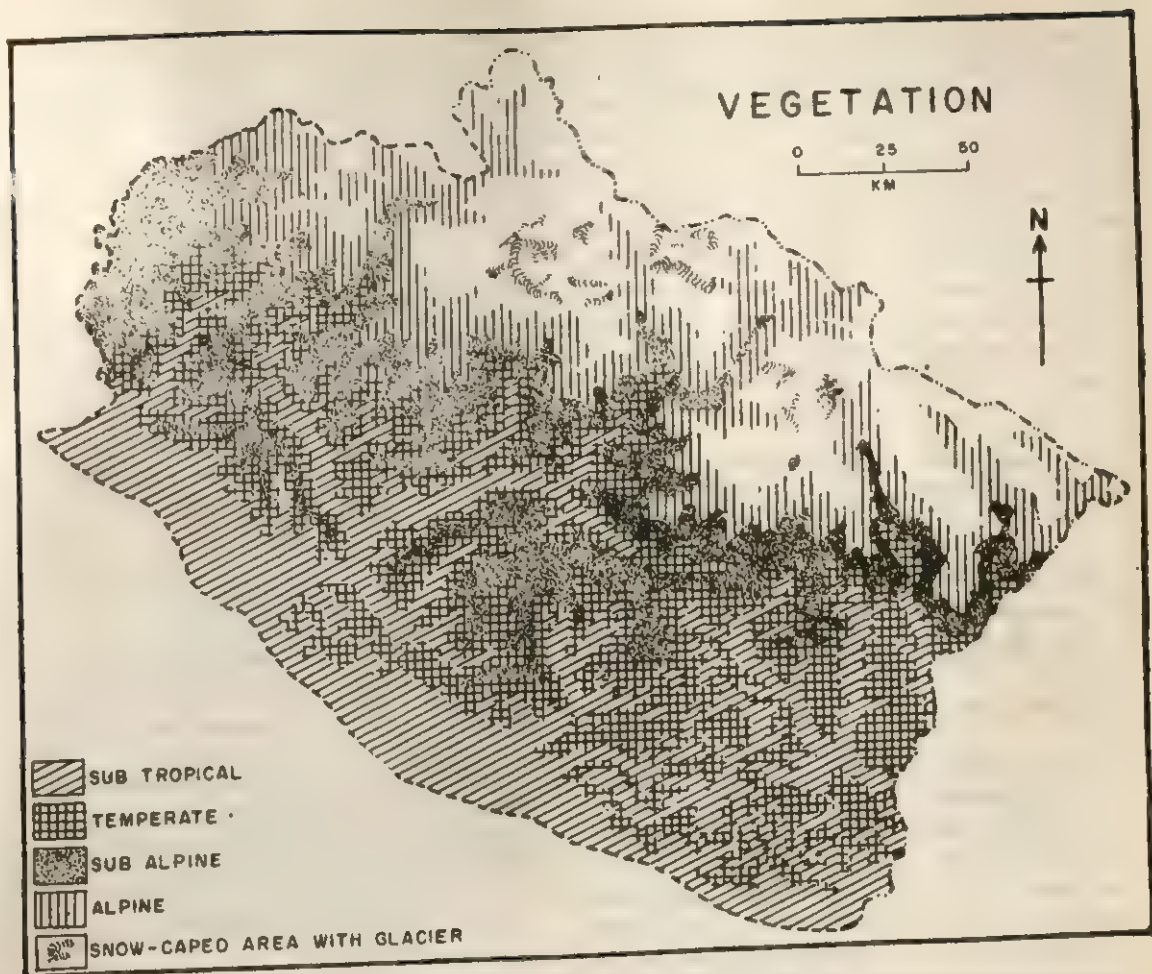


Fig. 10.7

Sub-tropical forest zone, extending from north-west to southeast, almost covers the Sub-Himalayan tract of the region. It is the northward extension of the sub-deciduous forest belt of *bhabar* areas. Sal is the most important species. These forests are commonly found up to about 750 m on the southern and 1,200 m on the northern slopes. Other important species are Kanju (*Holoptelea integrifolia*) Semal, Haidu, khair and sissu. The cane brakes and bamboo brakes (*Dendrocalomus strictus*) are also found in the wet hollows and along the streams.

The temperate forests are generally found between 1,050 and 1,900 m on southern and between 900 and 1,800 m on northern slopes.¹⁷ The chir

pine is the dominant tree of this zone. The undergrowth of the chir pine is very poor. Some species of deciduous forests are observed occasionally, otherwise the ground surface is covered with various species of grasses.

The moist coniferous forests with an admixture of deciduous and broad-leaved trees are the dominant vegetation of the lower sub-alpine zone. Three species of oak can be distinguished as (i) Banj oak (*Quercus incana* and *Quercus himalayensis*), (ii) maru oak (*Quercus dilatata*) and (iii) kharsu oak (*Quercus semecarpifolia*). Bruns (*Rhododendron arboreum*), associated with banj oak, form common species.

A considerable area is occupied by sub-alpine forests. The chief trees, mostly of higher sub-

alpine zone, are : silver fir (*Abies pindrow*), blue pine (*Pinus excelsa*), spruce (*Picea morinda*), cypress (*Cupressus torulosa*), deodar (*Cedrus deodara*), birch (*Betula utilis*), etc. In general, each forest occupies some definite localities; between 2,000 and 3,000 m cypress is often present, from 2,400-3,050 m, deodar and from 1,900-3,100 m blue pine and silver fir. The high-level birch forests are usually found in the tracts lying to the north of the main Himalayan ranges, usually between 2,950 and 3,600 m, covering the sub-alpine and the alpine zones. Above the birch and silver fir forests,

there is often a gradual transition through xerophytic bush land into alpine pasture. These alpine forests are found up to about 4,200 m and sometimes may be seen in small patches even above. The alpine pastures are the main vegetal cover on the high altitudes.

Soils

So far no systematic and detailed study has been made about the Himalayan soils. Kaushik¹⁸ has divided the soils of Garhwal as Peco-ecological zones :

TABLE 4 .

Pedo-ecological zones	Altitude in m	Climato-vegetal zone	Soil types
(1)	(2)	(3)	(4)
1. Siwaliks and the Duns	300- 900	Humid Tropical	Alluvial soils
2. Lower Bhagirathi-Alaknanda zone	900-1,800	Warm Temperate	Brown forest soils
3. Upper Bhagirathi-Alaknanda zone	1,800-3,000	Cool temperate to cold	Brown deciduous and grey coniferous fores soils
4. Alpine zone	3,000-4,500	Alpine	Mountain meadow and glacial soils.

Soils of this region do not form a compact block. They differ from valley to valley and slope to slope according to the different ecological conditions. Soils of the Upper Bhagirathi-Alaknanda are of mixed origin, i.e., glacial and fluvio-glacial. Soils of the talus fans and the flat terraces are silty to clayey loam and are very fertile. Alpine zone soils are mostly granitic sandy loam. The brown forest soils are widely distributed in many parts of the region. These soils are normally loamy in the A-horizon while the clay fraction increases in the sub-soil layers.¹⁹

Katil (Land on forest margins) soils are stony, completely immature and extremely poor. Soils of *Upraon* (land on hill-sides) lands are gravelly and sandy loams. They are light brown or brown in colour. *Taloon* (land in the valley bottoms) soils are brown in colour with clayey loam texture.

On account of their stony texture, thin layer, heavy erosion and poor fertility, the soils of Garhkum region, in general, are very hard to

work upon. These soils, though poor for other crops, have proved very suitable for potato cultivation and horticulture.

The Cultural Setting

Population

In a mountainous region like the Himalaya, topography and climate exert more influence on the distribution of population than other factors. Maximum concentration of population is found in the middle zone along the lower parts of the Bhagirathi, the Alaknanda, the Yamuna, the Ramganga, the Kosi and the Kali valleys (Fig. 10.8). In the Himadri, the population is only confined to the valleys (Himadri valleys), particularly along the more open ones with better aspects and terrain.

The tracts having high percentage of *salaon* and *upraon* land have densities ranging between 100-150 persons per km². The density is also high in the Sor valley covering almost the whole tahsil of Pithoragarh (Fig. 10.8). The wide

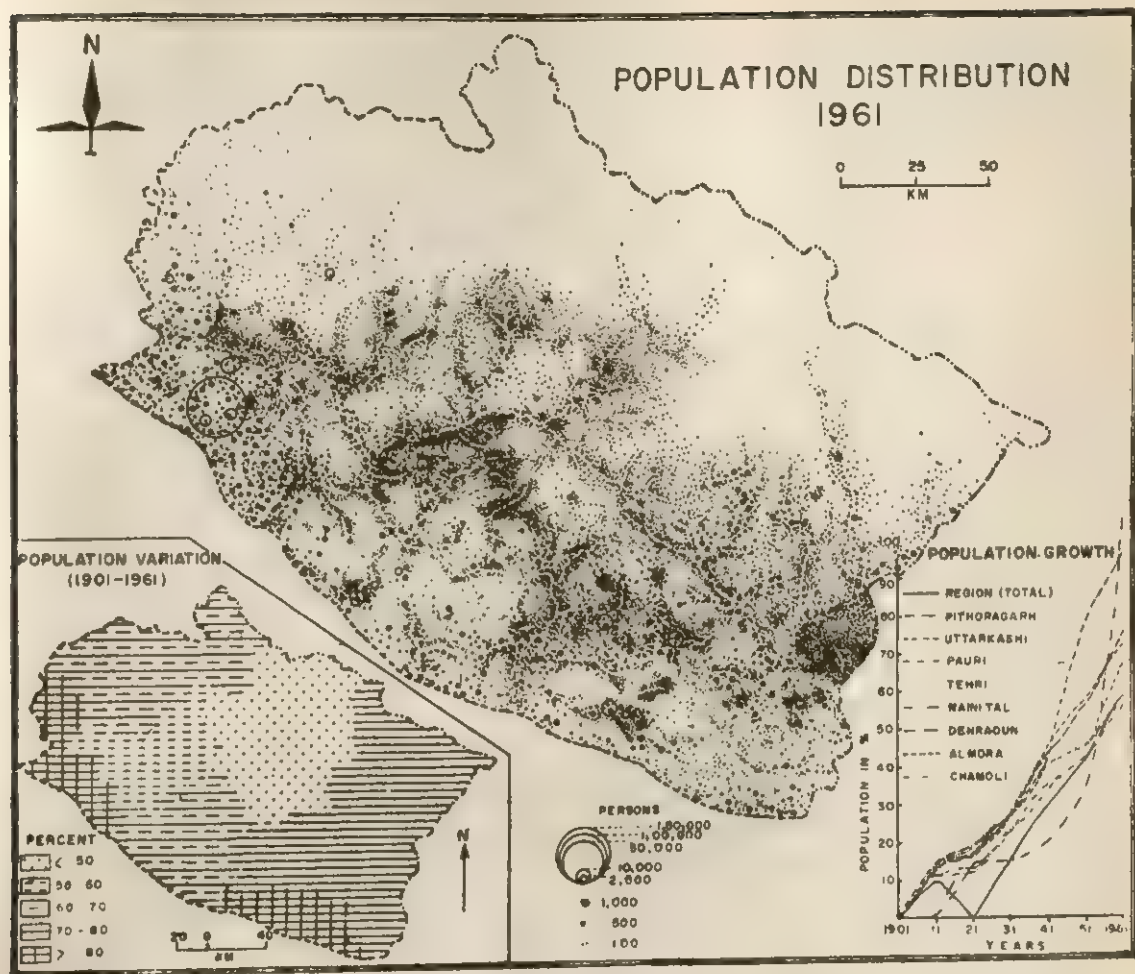


Fig. 10.8

valleys and extensive river terraces in Chham-Tehri and Kirtinagar-Srinagar areas with sufficient irrigation facilities enabling as many as three crops to be grown carry 150 to 200 persons per km², unctiguously in the blocks of Pratapnagar, Jakhnidhar, Pauri and Kajlikhal of Garhwal and Tarikhet, Hawalbagh, Bin and Munakot of Kumaon. The map showing percentage of cultivated area provides a fair correlation with the rural density in Garhwal and Dehra Dun Himalaya.† In the zone of high density, the percentage of cultivated area is above 12.5 and in that of highest density, it is above 25.

† Data of Kumaon Himalaya are not available to the author.

The most conspicuous feature of the population map is that about half of the area of Joshimath and Bhatwari blocks of Garhwal Himalaya and Munsiri and Garbyang blocks of Kumon Himalaya carry no population as they remain covered with snow for the major part of the year or are too cold for human habitations. Adjoining this negative area lies the next zone between 2,400 and 3,600 m which has very low density of less than 10 persons per km². Here, the percentage of cultivated area is low and only one crop grows in a year.

The Siwaliks, a major part of *duns* and the foothills of the Himanchal are covered with dense forests where the density of population ranges

between 5 and 10 persons per km². The forest clearings, however, in this zone support very high densities of population. If the area under reserved forests is excluded, the density of rural population for the *dun* of Dehra shoots up to 220 persons per km², elsewhere it is about 90 only. Actually, the region has two peripheral belts of sparse population, one lies along the snow-bound area and the other along the forested Siwaliks.

Trend of Growth : During the past the region has experienced relatively low population growth due to the preponderance of natural calamities, superstitious social customs, such as polyandry, and migration of young people in search of employment. Attacks of wild animals, avalanches, floods, landslips, diseases, etc., used to claim a fair number of lives. The region has recorded about 86% increase in its total population during 1901-61, and except during 1911-21, the growth of population has been more or less steady in the last six decades (1901-61) (Fig. 10.8; inset). During 1911-21, epidemics and a serious famine claimed a large number of lives, the region registering only 2.3% increase in population while the earlier decade had marked over 13%. The 1951-61 decade has registered the highest decennial increase (15.2%) over the last sixty years. On the basis of 15 per cent decennial increase, the population of the region will rise to 3.05 million in 1971 and 3.51 million by 1981.

About 10.5% of the population of the region is urban as compared to about 13% of U. P. as a whole. The region shows wide sub-regional disparity in the distribution of the urban population; while Uttarakhand is the least urbanized (0.4%), Kumaon has 5.0% of its population as urban and Dehra Dun district records over 4.6%. In fact, Chamoli and Pithoragarh districts of Uttarakhand recorded no urban population in 1961; however Pithoragarh has been raised now to an urban status since 1962. Commerce and industry are much less developed and even the service centres are very few in the region. Only monthly or fortnightly fairs held at the holy places provide most of the requirements of the rural folk. Religious and administrative func-

tions are primarily responsible for the initiation of urban activities.

The growth of urban population in the region has been steadily upward since 1901. The total growth in 1901-61 is over 373 per cent, whereas its share in the total population remains only 10.5 per cent (Table 5). There were only nine towns in 1901, with a total population of 63,485. The number reached 15 in 1931 when the population increased by about 70 per cent since 1901. This increase was mainly due to the addition of cantonments. By 1951, the number of towns had increased to 21. The towns like Uttar Kashi (Uttar Kashi district), Tehri, Narendra Nagar, Devprayag, Dogadda (Tehri district) and Clement town (Dehra Dun district) were added in this period. Two more towns have been added to this and the total urban population has increased to 300,500 (1961). Two more towns, i.e. Pithoragarh and Lohaghat (Almora) have been added increasing the number of towns to 25 (Table 5).

TABLE 5
Growth of population

Census Year	Total population in '000	% increase	Urban population in '000	% variation
1901	1,430	—	63	—
1911	1,618	13.1	90	41.9
1921	1,655	2.3	99	9.7
1931	1,808	9.2	108	8.9
1941	2,066	14.3	154	43.1
1951	2,308	11.7	255	65.4
1961	2,658	15.2	301	17.9

Sex ratio is highly unbalanced in the Garhkum Himalaya as most of the young men go out in search of employment in the plains or seek military service. The sex ratio ranges between 719 in Naini Tal to 1,202 in Tehri. As tourist centre, Naini Tal attracts a large number of male labourers from the interior parts of the region, thus inflating the number of male population in the district. Naini Tal has almost the same sex ratio in urban and rural areas, whereas there is much

difference in other districts. The low sex ratio in Uttarkashi (964) is also on account of the practice of polyandry which reflects the adverse sex ratio.

TABLE 6

Regional distribution and growth of towns

Town	1901	1951	1961
Uttar Kashi	—	1,205	2,677
Tehri	—	2,856	4,508
Narendra Nagar	—	1,288	1,632
Deoprayag	—	1,040	1,456
Pauri	—	5,250	7,484
Lansdowne			
Cantt.	3,943	4,419	6,381
Srinagar	2,091	2,385	3,031
Dogadda	—	1,241	1,919
Bah Bazar	—	—	535
Almora	8,596	12,757	16,602
Almora Cantt.	—	641	598
Ranikhet	3,246	8,937	10,642
Naini Tal	6,903	13,093	16,086
Naini Tal Cantt.	—	743	1,085
Bhowali	—	1,895	1,457
Dehra Dun	30,995	144,216	156,341
Dehra Dun Cantt.	—	27,812	26,577
Rishikesh	—	7,495	10,925
Mussoorie	4,741	7,133	9,849
Raipur	—	—	8,344
Clement Town	—	7,720	7,793
Chakrata	1,250	1,283	3,195
Landaaur	1,720	1,415	1,389
Total urban population	63,485	254,824	300,500

The working population accounts for 61.4 per cent of the total population as compared to about 40% in U.P. as a whole. Agriculture is by far the most important occupation in the region. The percentage of cultivator and agricultural labourer varies from 86.3 in Pauri to 93.0 in Tehri except Dehra Dun where this percentage is only 61.1. The population engaged in household industry ranks second in all the districts, except Pauri and Dehra Dun where it is replaced by production other than agriculture.

Rural Settlements: About 2.4 million rural population of the region is distributed in 14,177

villages of various sizes. The average population per village varies from 142 in Pauri to 235 in Almora while Dehra Dun records the highest (304) which is less than half of the national average (636). Thus the rural population lives here mostly in small-sized villages.

River valleys, terraces and spurs offer the most favourable sites in the region. The villages are sited on such locations as are free from landslides and avalanches. With terraced fields above and below, spurs provide the most common sites for village settlements. Actually, fields extend from the valley bottom to the ridges and it is convenient for the peasants to look after their fields from a midway location; the settlements are generally located near the perennial springs or water holes. On such midslope sites, the climate is neither so cold as on the ridge top nor so sultry as in the valley bottom. However, the wide valley bottoms attract a large number of settlements in the region.

Two broad types of rural settlements can be recognised in the region, viz., (i) agglomerated or nucleated and (ii) dispersed with many intermediate variations (Fig. 10.9). In fact, compaction here means clustering of community groups and in a village there may be one or more such clusters. Dispersed settlements are in the form of more or less isolated farmsteads which are characteristic features of rugged and forested terrain. In such types of settlements, the plots owned by one family are generally separated from those of others by hedges or sometimes by stone-walls.

In some localities sorts of 'twin village' settlements are found. The villagers own two houses, one on the lower altitudes or valleys called *talla village* and another on high altitudes or ridges called *Mulla village*. The former is used during winter and the latter in the summer. In other cases there are two types of habitations in the same village. The winter habitations form a compact settlement in the lower part of the village whereas the summer habitations are scattered on higher elevations. At least one-half to one-third of the population of the village practises transhumance and the people occupy

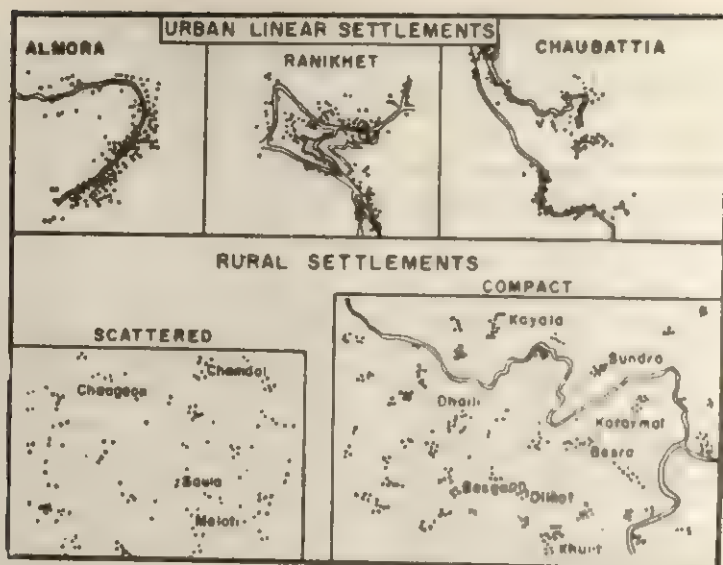


Fig. 10.9

two dwellings by turn. These are permanent structures and each is occupied during a part of the year. Such phenomenon is also found in the Alps.

Despite great variation in local topography, the lay-out of the main villages follows some definite patterns. The settlements are scattered either on small patches of flat land at varying heights or on the low-lying valley sides. The village land can be divided into three zones²¹, i.e., (i) the upper reaches which generally comprise of forest or pasture lands are used for livestock rearing, while some portion is devoted to un-terraced fields for intermittent cultivation; (ii) the middle zone occupies the main residential site surrounded by gently sloping lands and dry terraced fields, and (iii) the lower reaches are confined generally to the valleys, having the irrigated fields with some water mills (*Gharat*) for flour millings (Fig. 10.10).

The houses are generally double storeyed with stone walls and the roofs covered with slate, which are arranged irregularly over the wooden ceiling provided by flanks supported on beams in which long nails are driven so that the slabs might not slip down the roof. But in some localities where slates are not available, the roofs

are covered by corrugated tin sheets. Generally the roof of the house is sufficiently sloping ($25-30^\circ$) to cope with the showers and snow-falls. Stone walls of the houses are plastered by mud and sometimes whitewashed. Very few houses have verandahs. The height of the doors ranges between 1.5 and 2 m and the windows are also small and few.

The villages are quite unplanned. There is restriction on the directions of the entrance of the houses which generally face the valleys. Availability of sunlight is an important consideration.²² Thus, there is no definite street pattern in these villages. In localities where considerable flat land is available, houses of kins are built close together, frequently with common walls. The houses have usually an open area in front of them (outside the house) called 'Angan', where corn, wood and fodder are dried. Every village has its own place of worship either within the village or very close to it and sometimes midway between two villages. It is to be noted that these places of worship are generally located either on high grounds or on the river banks. Cattle-sheds are built close to the houses, generally on the lower altitude, but on the high altitude these stand away from the village. The roofs

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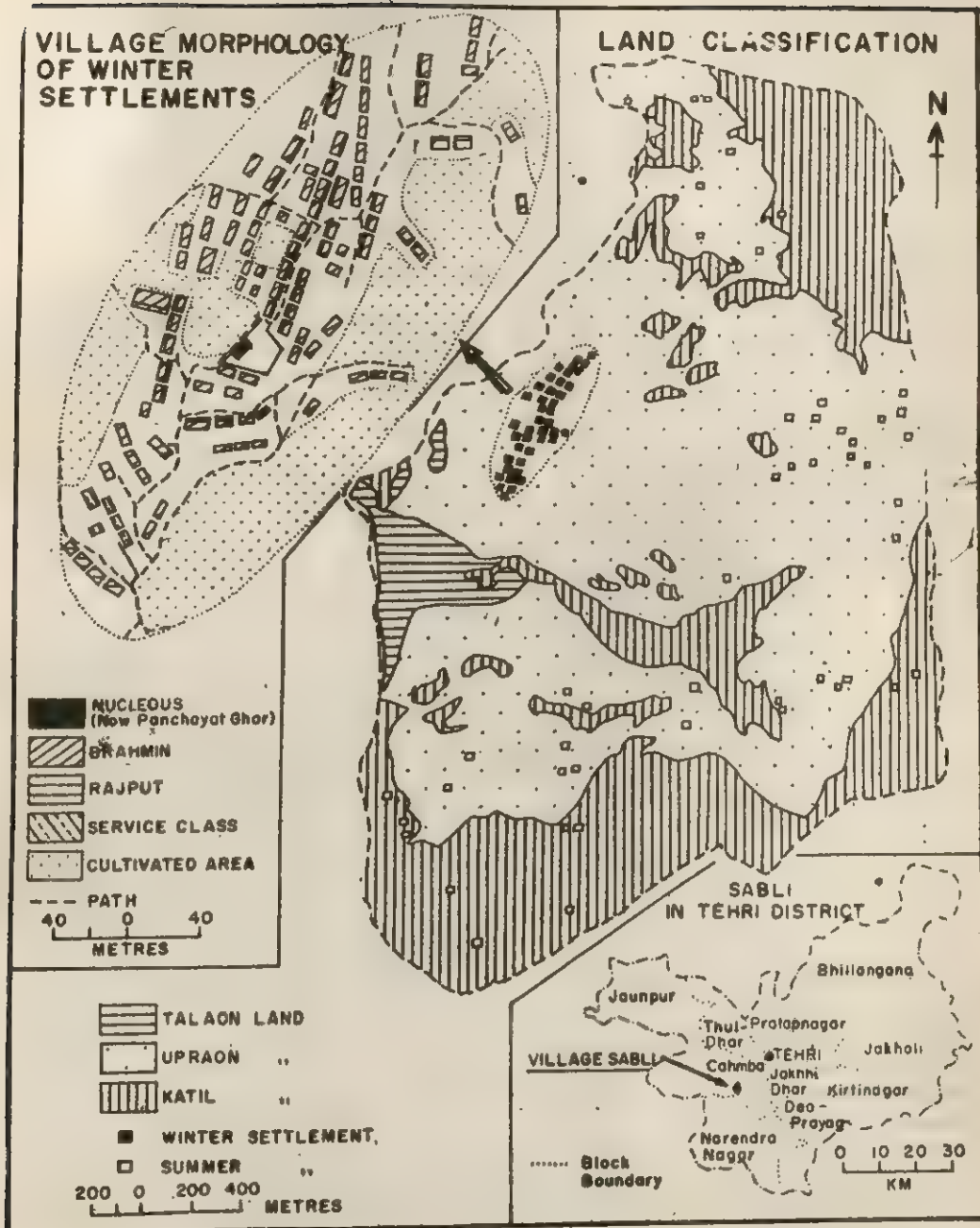


Fig. 10.10

of the cattle-sheds of poor class families are usually thatched with either rice or wheat straw,

but those of middle and high class families are of slate or tin sheets.

The house types are divided into three categories : (i) 'A' type houses are occupied by the head man of the village and rich Brahmin and Rajput families. These houses are usually two to three storeyed. The livestock is kept in separate sheds. (ii) 'B' type of houses are occupied by lower rank of people. They may be poor Rajput, Brahmin or other lower castes. The houses are generally two-storeyed. The ground floor is utilized for grain storage and livestock, whereas the first floor, generally comprising of two apartments is used for sleeping and other domestic activities. (iii) 'C' type of house is occupied by low caste people i.e., Doms, Orhis (carpenters), etc. These houses are generally single storeyed. In most of the villages the houses of the upper castes (Rajputs and Brahmins) are situated on the higher or central portion of the slope and those of the lower caste group (Kolts and Doms) are sited near the valley beds.

General characteristics of the rural landscape of Garhwal can be suitably illustrated by a brief description of village Sabli²² (Fig. 10.10). Located at a distance of 5 km from Chamba on the Rishikesh-Tehri road, Sabli (30°19' N-74°24' E) is a typical village of Tehri district with an area of 402.3 acres and population 1,001 (160 Households). The village was founded by Shri Hari Ashram Bahuguna in the 17th century. Now the descendants of his four sons live in four separate quarters, called *theks*. The altitude in the village varies from 1,200 m to 2,100 m. The village settlement is located on a spur and has an oval shape. During summer about 60 per cent of the population migrates to the higher slopes where they have to harvest their rabi crops and graze their cattle. After sowing rabi crops, they migrate to lower levels in winters. The winter settlement is compact, and the houses are double storeyed, the lower storey being usually occupied by animals. Summer residences are scattered and are mostly single storeyed. They are known as *Chhatis* or *Thaks* with only one or two rooms, one on the top and one on the bottom. The village is dominated by Mahatma Bhairava who occupies the 84 per cent of the 100 houses in the village.

people (blacksmith, carpenter and drummer) live in separate quarters and occupy lower sites in the village. Agriculture is the main occupation but at least one person from each family is in service. There are 45 persons working as teachers in the schools of the neighbouring villages. The production of foodgrains is insufficient and people have to import about 40 per cent of their food grains.

Urban Settlements

The Garhkum region has 25 towns including one city. Almora (17,200) and Naini Tal (17,165) enjoy almost the same status but having only about one-tenth population of Dehra Dun city (182,918).

Towns occupy five types of site in this region : I. *Ridges*—Mussoorie, Ranikhet (hill station and Cantonment), Chakrata (Cantt.), Lansdowne (Cantt.), Pauri and Almora (district headquarters); II. *Valleys*—Dehra Dun and Naini Tal (hill station and district headquarters); III. *River Terraces*—Srinagar, Kirtinagar and Uttar Kashi; IV. *Confluences*—Tehri, Devprayag, Rudraprayag, Karnaprayag and Bhowali; V. *Gate towns*—Rishikesh, Kalsi, Kotdwara, Haridwar, Kathgodam, Tanakpur.

Religious and administrative functions play a vital role in the process of urbanization in this region. According to Hindu philosophy a spot of beauty is no place for social enjoyment or self-indulgence. It is the place for self-restraint, for solitary meditation which leads the mind from Nature up to God. Nowhere else this concept is exemplified more in India than in the Himalayas. Thus, religious cities have developed around the famous holy shrines which have been set up by saints at sites of exquisite natural beauty where devotees could perform their penance and meditation in a calm and serene and sublime atmosphere. The town of Badrinath has grown up on the right bank between hot springs (below the temple, and the confluence of the Rishiganga with the Vishnuganga. The township is highly congested along a narrow road. The town of Kedarnath is located just below the terminal moraine in the centre of the U-shaped valley. The township has a linear pattern. Devprayag,

the confluence town, is highly congested in a narrow triangle with its apex at the lower level and the base at the higher level. Most of the towns of the old Tehri State have been founded by its rulers after their names, e.g., Kirtinagar, Pratapnagar and Narendranagar. With the formation of three new districts, the headquarters of Chamoli, Uttarakashi and Pithoragarh have become progressive towns. Joshimath, Pithoragarh and Dhar Chula have now become important military centres. Most of the towns depict a linear pattern as they have developed on ridges or terraces.

The *dun* of Dehra is one of the most highly urbanised tracts of India with 54 per cent of its population craved as urban. During the last

decades, the urban population of Dehra Dun town group has increased at an explosive rate, i.e. five times since 1901. For a distance of six or seven km. the city is growing like a ribbon along all the main roads radiating in different directions giving it a stellar shape.

Similarly, between Haridwar and Roorkee, there is a fragmented ribbon of urbanism which has been all the more developed with the establishment of the Arms and Ammunition factory at Virbhadra and Military centre at Rawala. The whole strip (about 24 km long) along the Ganga is strewn with religious and educational institutions.

Dehra Dun city lies on the low interfluvium of the Binala and the Ropani (Fig. 10-11). In



Fig. 10-11

1676, the Moghul Emperor Aurangzeb conferred a few villages in the valley upon the dissenting Sikh leader, Sri Guru Ram Rai who came from the Punjab and settled here."²⁴ The city grew round the old Gurudwara in small low houses along narrow winding lanes. Mild climate, well-drained site and dust-free atmosphere attracted the retired officers to settle here. Thus, the new colony of Dalanwala developed in the eastern part of the city with its red-gabled bungalows peeping out of the evergreen trees and hedges. Two military cantonments were set up in 1872 and 1908 respectively in the northwest, and in due course of time a 1.6 km long market known as Paltan Bazar (literally meaning military market) grew up from the site of the present clock-tower to the Gurudwara. During the Second World War, a new cantonment at Clement Town and an Ordnance factory at Raipur were set up. The headquarters of the Oil and Natural Gas Commission (O.N.G.C.) were established here in 1956. All these new additions accelerated the growth of the city.

Woollen, Cotton and Silken textile mills (one each) are situated in the northern, western and southern parts of the city respectively. A large number of saw mills are located on the Saharanpur road where it is easy to bring logs by trucks from the forests. Several miniature bulb factories are located on the outskirts and the limestone kilns are generally concentrated in the Rispana bed. Thus, all the industrial establishments are located in the outer zone of the city.

Dehra Dun is one of the most important centres for educational and research institution in India. In particular, it is famous for its English medium public schools. Among institutions of higher learning, Indian Military Academy, Forest Research Institute, Indian Institute of Petroleum and Indian Photo-Interpretation Institute deserve special mention. Survey of India has its headquarters here.

The city has developed along the axis of Paltan Bazar in a triangular shape with its base in the southwest and apex in the northeast. The morphology of the city has been influenced by the shape of the interfluvium which becomes narrower

towards northeast. Compactly settled part of the city occupies the land having the lowest gradient on the interfluvium, i.e. 14 m/km. Areas of higher gradient lie in the outer zone. The main business centre lies near the Clocktower where the new and the old city meet and important roads radiate in all directions. Important banks and high class shopping centres are also located here.

Almora (29°76' N and 79°40' E) is the district headquarters. The town (including Cantonment area) is built on saddle-shaped ridge about 3 km in length running in almost E-W direction with an elevation varying from about 1,700 to 1,800 m.

Its original nucleus was Khagmara Fort, situated on the eastern slope facing the Sual river, opposite Bandani Devi. This area was inhabited by Katyuri princes in about 14th century. Later, the town was developed by the Chand rulers between the 15th and 16th century.²⁵

The present bazar roughly extends from Police Station to Nanda Devi temple on the saddle. The upper storeys in this area are mostly residential. The residential areas are generally located in Unar, Kungakhola, Nanda Devi, Tilakpur, Jakhan Devi, China Khan, etc. The houses of better class people occupy positions below the main ridge to the north and the south and are spacious with small orchards and green fields.

The administrative buildings and the hotels are located in an area which is roughly tongue-shaped wedged in between the two roads (along the Mall road). Almost all the buildings in this zone are unfunctional. The Mall road has attracted the educational institutions also. There is only one public park along the Mall road. The court yard of Nanda Devi temple serves as the public meeting place.

Naini Tal (29°24'N and 79°28'E; Elev. 1,938 m) with an area of 11.37 km², is situated in a valley of the Gagar range extending NW-SE on the flanks of the pear-shaped lake basin (Fig. 10.12a), being easily accessible from the plains. About three-fourths of the town lie between 1,950 and 2,250 m.

Though the place is associated with earlier settlements (particularly religious), it was recom-

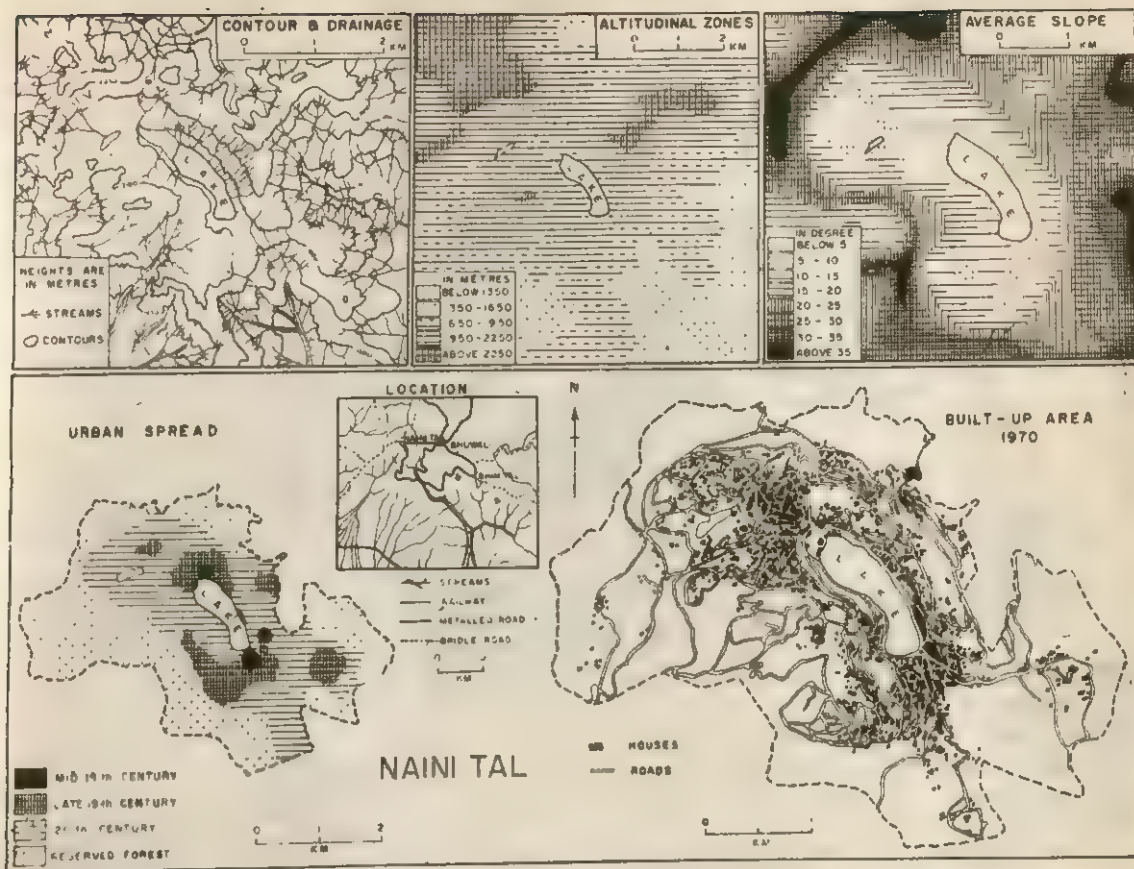


Fig. 10.12 (a)

mended by Barron in 1841²⁸ as a suitable site for summer resort; later in 1862 the place developed to become summer headquarters of the provincial government.

The rapid development of the cultural landscape took place in late 19th century. Houses, shops, schools and many hotels sprang up all around the lake. Although there had been a great catastrophe in 1880 when a huge landslide had destroyed most of the settlements on the northeast of the lake, yet the same provided a fresh site on the upper end of the lake, now named as 'Flats'. In 1882, the railway extension to Kathgodam terminus gave a great impetus to the growth of the town.

The functional segregation is not distinct in the townscape. Talli Tal and Malli Tal at the opposite ends of the town are important business areas, though also partly residential. High class

shopping area has developed along the Mall (now Pant Marg) near the 'Flats'. The residential segregation between Europeans and low and middle income group has, however, been replaced by high class residential areas; the former occupies the higher ground and the latter, the lower portions (Fig. 10.12a).

Most of the administrative functions including the Government House are concentrated in the Talli Tal area, while municipal office, police station, post office are located in Malli Tal area. Naini Tal has been well-known for its European schools and colleges whose patterns have now changed since Independence.

Tourist facilities including various modern utilities and recreations have naturally accrued here such as skating, yatching, horse-riding, hiking etc. (Fig. 10.12b).

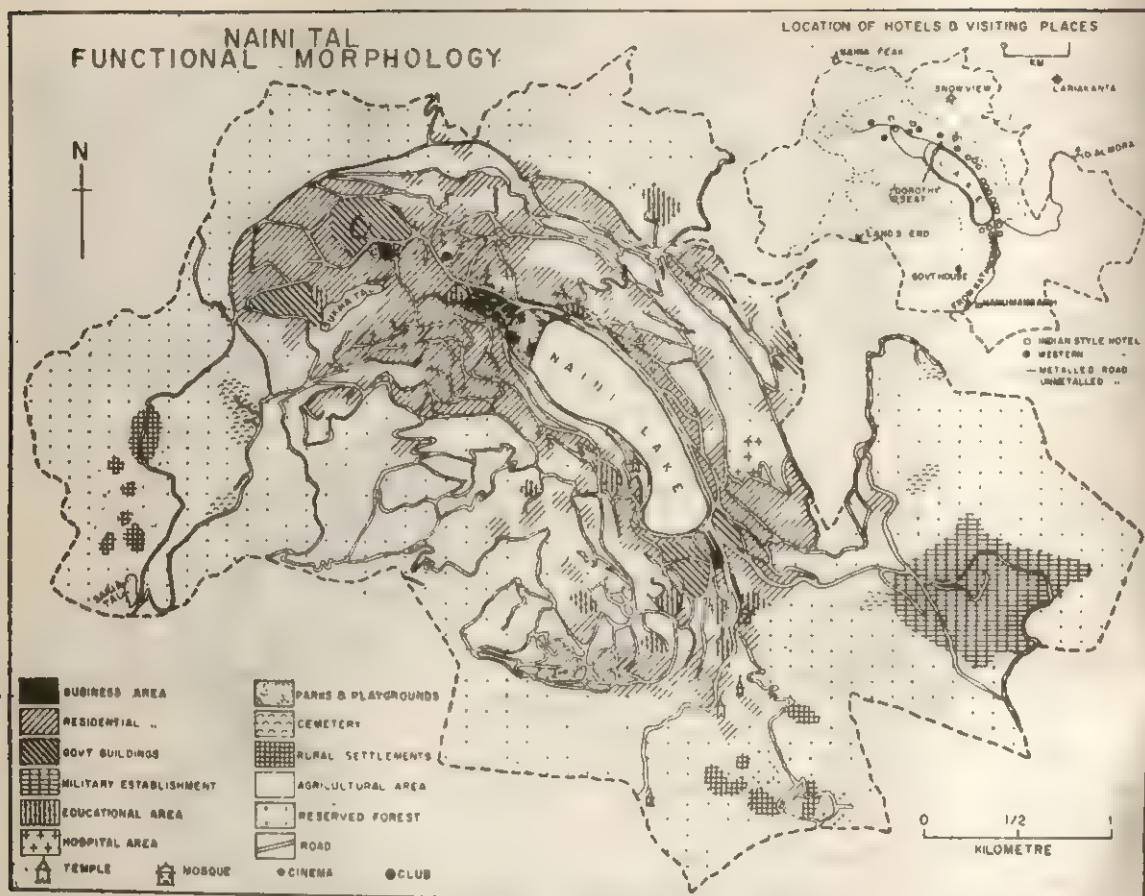


Fig. 10.12b

Bhowali (1969 est. pop. 1,934), a small health resort with T.B. Sanatorium at a distance of about 11 km from Naini Tal, and developed between 1650-1750 m is a multifunctional nodal service centre where the routes converge from Kathgodam, Almora, Ranikhet and Mukteshwar. It is an important fruit and vegetable collecting and exporting centre (apples, apricots, plums, pears, etc.). The settlements are mainly developed along the valley in which the Bhowali Nala (Uttarvahini), a tip-tributary of the Ninglat river, drains the surrounding slopes (Fig. 10.13, Inset).

The town has a sizeable service area (Fig. 10.13). The business-cum-residential areas have developed along the main arterial road whereas purely residential areas, mostly covered by private bungalows, are located on high altitudes.

Pithoragarh (29°35' N and 80°15' E; 1970, est. pop. 12,000) enjoys a highly strategic position on the Indo-Tibet border and is one of the most progressive and recently developed border towns of India. It is situated on an elevated intermont basin (1,636 m above sea level), locally known as the 'Sor Valley'. The town lies on the main trade route between the plains and Tibet, mainly used by the Darma Bhotiyas of the Himadri valleys (Bhotiya valleys). It was formerly the site of a cantonment and the old fort is still existing on a high ground. Much of the cultural landscape has developed after the Indo-China war in 1962. It has added now a new market apart from the old market (Purani Bazar). Many new residential colonies, both for junior and senior officers, have now been

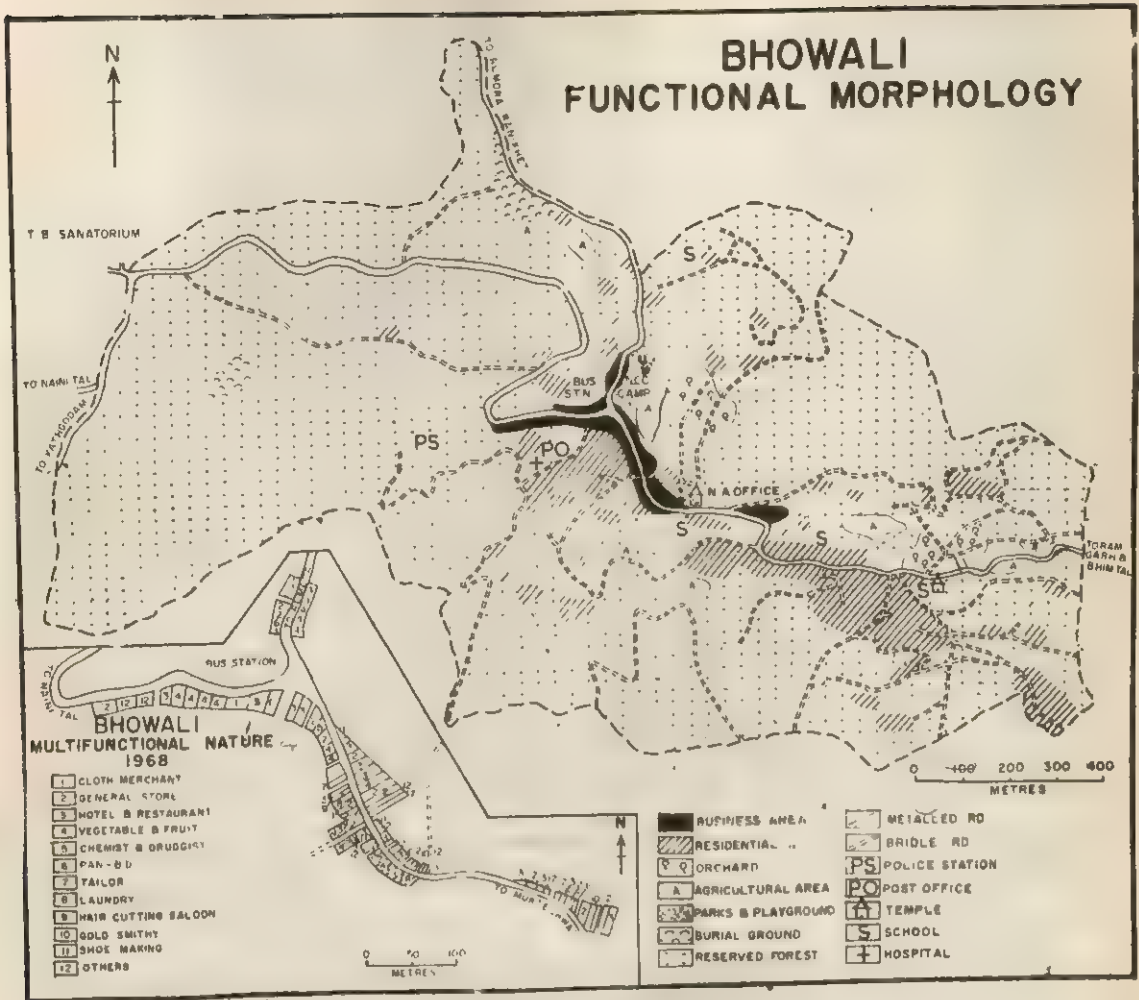


Fig. 10.13

built up. A large area is occupied by cantonment which is still expanding towards the east of the town.

Lohaghat ($29^{\circ}24'2''$ N and $80^{\circ}7'53''$ E; 1969, est. pop. 1,372), a newly declared small town, is located along the Tanakpur-Dharchula border road in an elevated intermont basin (1,655 m), about 11 km west of the Kali river in Almora district. The name is said to recall a bloody fight in the neighbourhood. Originally, the place had been the cantonment for the 3rd Gur-

khas, but was soon abandoned with the disappearance of outpost on the Nepal border in the east. It was earlier a centre of a small European population.²⁷ It has a local hydel power station. The morphology and land use clearly reveal a typical pattern of a small service centre. A large area of the town is occupied by pastures and shrubs, orchards and cultivated land. It is a street-town with more than 90% of the settlements strung along both the sides of the main bazar stretching north-south.

Agricultural Economy

About 16.5% of the total area lies under snow and 52.5% under forests (Fig. 10.14). Only 10.3% of the total area in Garhwal Himalaya is under cultivation, whereas in Kumaon Himalaya this percentage is higher (16%). Like the Himachal Himalaya, the cropping pattern in the Garh-kum region reflects the varying conditions of altitude, climate and soil on the one hand and on the other the various agronomic and cultural practices and traditions evolved over the centuries such as elaborate terracing, crop rotations and *gul* irrigation system which also provides for small water-mills. The physical environment has infused a high degree of adaptive skill and uncommon physical vigour among the people to cope with the inhospitality of the environment.

A typical valley section of the region exhibits three distinct categories of land use.²² In the (i) 'Katil' or 'Khil' land hoe cultivation is practised with a rather standard intermittent rotation of three crops in five years. After a few years of intermittent cultivation, such land is finally terraced and regularly cultivated. *Madua* (Mandua) or *Kodo* (*Elusine coracana*) is the most important crop favoured in this form of cul-

vation. Other crops are *Jhangora* (*Oplismenus frumentaceus*) and *Morra* or *Chna* (*Amaranthus frumentaceus*), (ii) *Upraon land*—permanently terraced but unirrigated cultivation is found in the *Upraon* or *ukhar* lands, with *Majua*, *Jhangora* and *Chna* as main crops, (iii) *Talabu land*—is mostly devoted to paddy in lowlying irrigated areas, called *sera* which are invariably double cropped, while the other is of *Tanr* type used for broadcast paddy, sometimes irrigated by *gul* system.

From ecological point of view the distribution of crops follows some sort of vertical zonation as well.²³ Wheat is widely distributed (even in the cold zone, 2,400-3,600 m, where it grows as a summer crop); whereas rice remains confined only to lower and middle zones (300-1,800 m). Millets are highly diffused except in the cold zone. While barley is grown in the upper zone (1,800-3,600 m), sugarcane thrives only in the lower *Dun* (300-600 m). Potato thrives everywhere except in the lower zones.

Rotation of Crops : 'Three-crops-in-two year' rotation is the most important and is prevalent on *upraon* lands (Fig. 10.15). For the sake of these crop rotations, the cultivated area of the village is divided into several parcels (*Sar*). Each *Sar* is allotted a definite crop rotation.

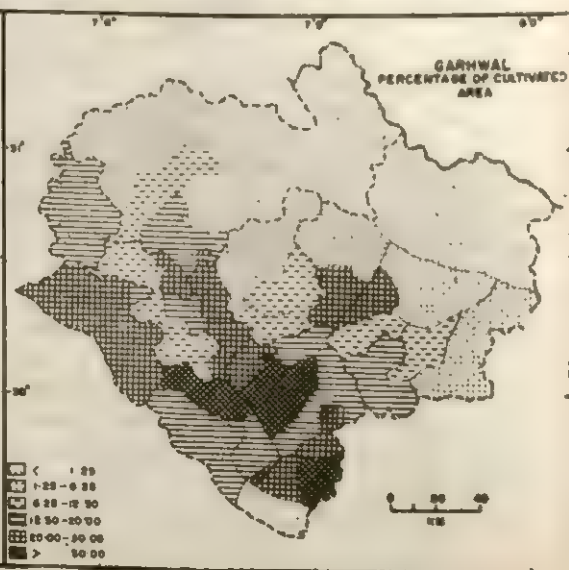
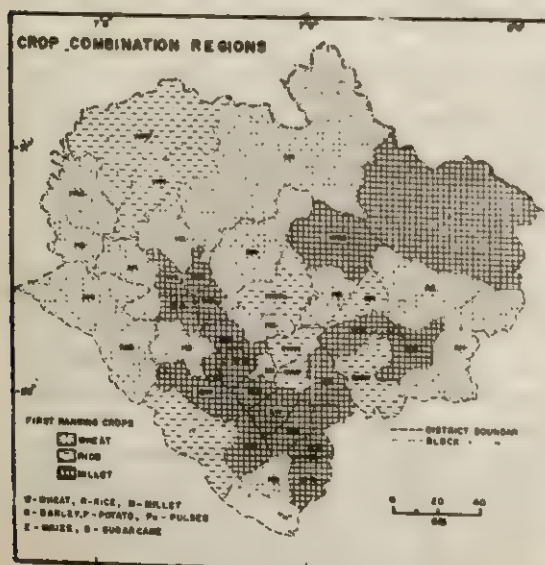


Fig. 10.14 (a)

Fig. 10.14 (b)

The *Sar* growing rice is called *Dhan-ki-Sar* or another growing *madua* is known as *madua-ki-sar*.

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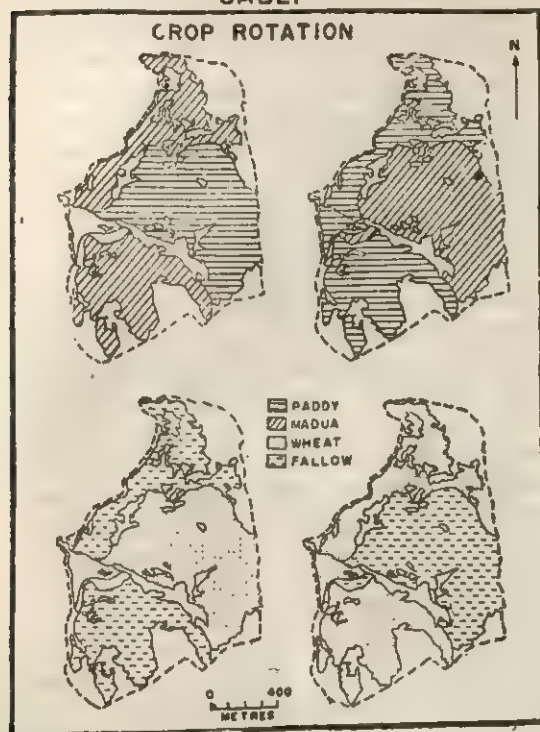


Fig. 10.15

Land classification and cropping pattern in Garhkum area can be better understood by a reference to Sabli village (Table 7).

TABLE 7

Year	Season	Crop in <i>Sar</i> No. 1	Crop in <i>Sar</i> No. 2
First	Kharif	Paddy and Jhangora	Madua
—do—	Rabi	Wheat & Barley	Fallow
Second	Kharif	Madua	Paddy and Jhangora
—do—	Rabi	Fallow	Wheat

All the fields in the village are terraced and the height of the terrace wall varies from 2 to 5 m. The width of the terrace varies from 10 to 40 m depending upon the gradient. Farmyard and compost manures are generally applied.

Crop Combinations : Millets are the first ranking crop in the Garhkum Himalaya, while the second position is taken by wheat in Garhwal and rice in Kumaon region, the two crops alternating their position on the third level in the respective areas. Garhwal has been divided into three first order crop combination regions* on the basis of data (1966-67) for 41 blocks (Fig. 10.14a). So far as diversification is concerned, five combinations are of four crops, eight are of three crops, and three of two crops. All the four crop and two-crop combinations occupy single tahsil each and do not form any compact zone. Among all the crop combinations, the MWR combination occupies the largest area covering twelve blocks. Eighteen blocks have millet as their first ranking crop, fifteen have wheat and eight rice. It is significant to note that barley is the fourth ranking crop in as many as thirty blocks. The distributional pattern of each of these crops reflects differences in the availability of water, nature of terrain and method of cultivation. Obviously, the dominance of rice is found in the *talaon* lands, while that of millets in the drier *upraon* and *ketil* lands.

The Millet region includes a number of inferior crops out of which *madua* and *jhangora* are very important. Such crops occupy 28% of the total cropped area. This region comprises five sub-regions based on the crop-combinations of MWR, MRW, MWpu, MWRB and MP. The MWR subregion (covering twelve blocks) occupies the intermediate zone between the higher and colder northeastern part and the lower and warmer southwest. The MRW subregion occupies a more southerly location where warm and wet valley-beds and lower slopes are favourable for the cultivation of rice which ranks as the second crop in this subregion.

The wheat region covers fifteen blocks and accounts for 29.3% of the total cropped area.

* The agricultural data of Kumaon (Pithoragarh), Almora, and Naini Tal districts) are not available to the author on block level and hence only Garhwal Himalaya (Uttar Kashi, Chamoli, Tehri, Pauri and Dehra Dun districts) has been taken into account.

Wheat occupies a dominant position in the Dehra Dun and upper Garhwal. The two subregions of WR and WMR cover six blocks each. Other crop combinations are WRSZ, WMB and WMRB. Sugarcane occupies an important rank in the humid lands of clayey loam in the eastern Dun (Doiwala block).

The rice region occupies eight blocks with wide valley bottoms and gentler slopes. It accounts for 24.2% of the total cropped area of Garhwal. The RW has developed in the more humid and hot climate of Dogadda block. Other subregions are RM, RMW, RWM, RWM¹ and RMWPu.

The cropping pattern in Kumaon is quite similar to that of Garhwal. Here millets, rice, wheat and barley occupy 36.9, 24.0, 22.2 and 9.0% of the total cropped area respectively. There is only one deviation from the Garhwal pattern in the case of rice which occupies second rank in Kumaon. Here, the valleys are wider, slopes less steep and the percentage of *talaan* land higher, which all account for the higher rank of rice.

Horticulture occupies a significant place in certain favourable areas of the region. Climate and soils in the altitudinal zones of 1,200-2,400 m are suitable for the cultivation of apples, pears, citrus fruits, cherries, plums, walnuts and apricots. There are many localities where horticulture is well developed such as Ramgarh, Mukteshwar, Paharpani (Naini Tal), Chaubatia, Binsar, Champawat, Lohaghat (Almora) and Gwaldam, Joshimath and Jokhdar (Chamoli). The State government has set up some horticulture centres as at Gwaldam, Singhdhar (Joshimath), Parsari and Jakhdhar in Chamoli, Ramgarh in Naini Tal and Chaubatia in Almora. A fruit-belt is developing on Mussoorie-Chamba-Gaza ridge and some more belts are in the process of development in many parts of Kumaon. In Uttar Kashi, there are 1,716 hectares under fruit cultivation. People are taking keen interest in the development of horticulture and there exists sufficient scope for the same.

Himalyan Transhumance: Various types of transhumance are practised in the region, dictated by the altitudinal control of temperature and

availability of pastures in different areas. The inhabitants of the Bhot region are all nomadic, their main occupation being trade and pastoralism. Agriculture is only a subsidiary occupation while wool spinning and weaving is their long-established cottage industry. Bhotiya people possess two or three sets of habitations lying in different altitudinal zones for different seasons (Fig. 10.16). During their upward marches, they live in temporary encampments. The total population of the Bhot region is 10,620 and the density is less than 94 persons per km.²

Their tea is salted, buttered and thoroughly churned in a hollow bamboo, called *dhomo*. An average family possesses 100 to 150 sheep and goats. There are two shearings in a year in March and September. The yield of wool per sheep is about 3 lbs. Bhotiyas graze the sheep and goats on Himalayan pastures called *bugyals*. They transport their goods on the back of sheep, goats, mules and zobas (a cross-breed of yak and bull). Their goats can carry 10 to 12 kg load at a speed of 8 to 12 km per day in the *terai*.³⁰ The sheep and goats also supply meat, wool and skins. Their dogs are smart, fearless and reliable. Their tents are light and utensils so designed that they can be inserted into one another, and the whole set can be contained in a bag. Bhotiyas are largely concentrated in the Dhawalganga valley, beyond Tapovan. Since 1962, trade with Tibet has completely stopped and consequently their economy has received a set-back. Inspite of their adventurous spirit and excellent business acumen, their talents are not being utilised and they have not yet been properly rehabilitated.

Gujjars are another tribe of pastoral nomads in this region, originally belonging to Jammu-Kashmir. During summer, they migrate to higher elevations (up to 3,000 m) with their buffaloes and in winter they come down to the forests of the *Dun* and the *Bhabar*. During the year 1969-70 there were 153 households in Dun forests with 1,567 buffaloes, 252 cows and 120 ponies. The number of buffaloes per Gujar varies from two to eight. They usually sell milk and *ghee*.

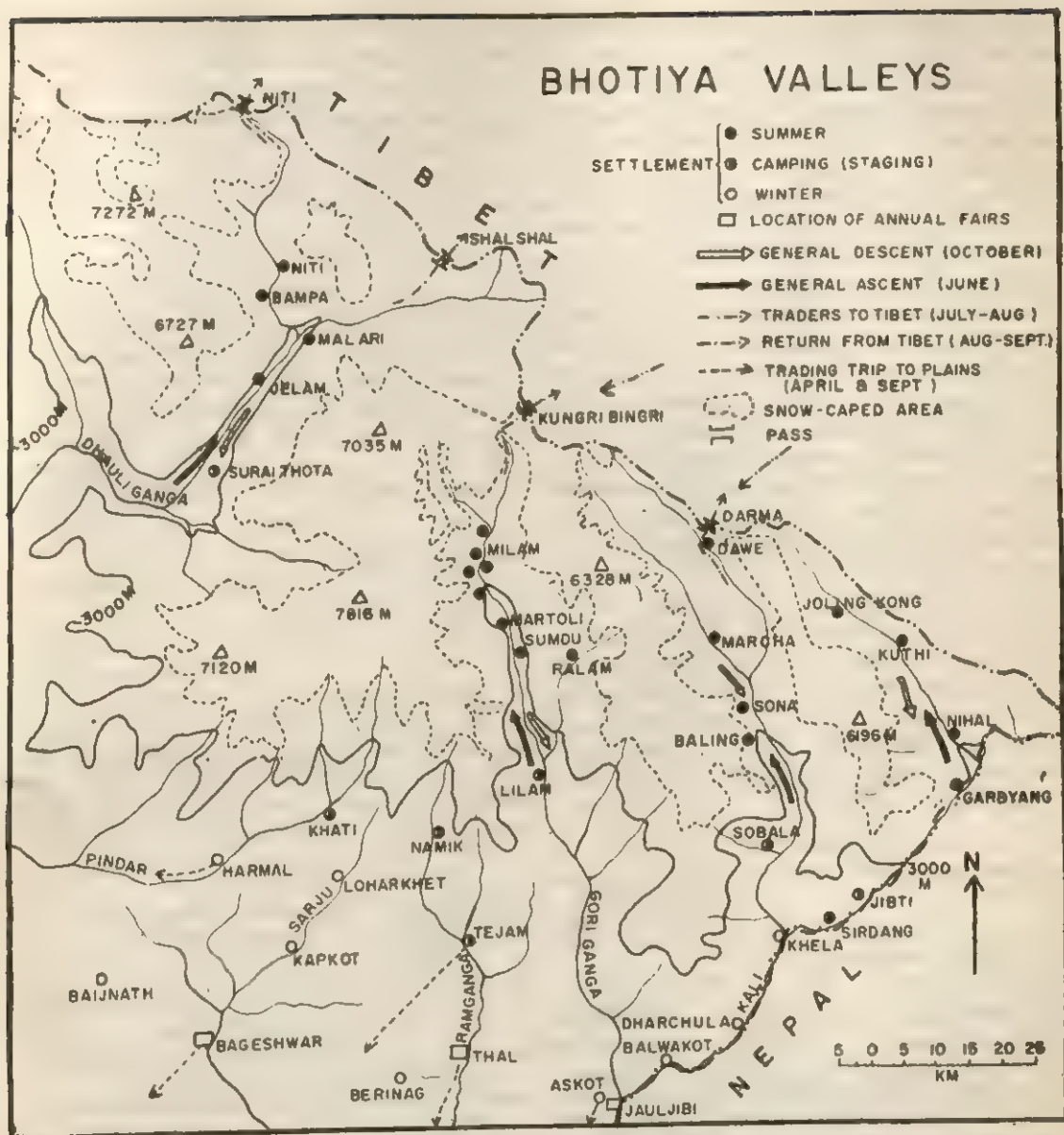


Fig. 10.16

Gaddis are also pastoral nomads who graze their sheep and goats on the pastures of this region. They have their permanent habitations in the high ranges of Himachal Pradesh. It is generally the youngmen who move up and down with their flocks. They lead a very hard and adventurous life and visit the highest pastures. They often stay in the open or live in caves.²¹

Industrial Economy

In addition to rich water power potential, Garhkum region derives its industrial resources from forests, livestock, agriculture including horticulture, and minerals to permit industrial development. This region has evidently great potentialities for developing a variety of small-scale and cottage industries based on cheap and

abundant hydroelectric and man power of the region. The greatest handicap, at present, is the lack of sufficient and efficient means of transportation and adequate technical training and dearth of the business community and local enterprise.

The region has great attractions for pilgrims, tourists and mountaineers. It has prominent shrines and tourist spots of everchanging resplendent scenic beauty with a wide range of flora and fauna. Here, pilgrimage can be combined with tourism and adventurous sports and recreations. The main stumbling block in the way to the growth of tourist industry has been lack of proper publicity, non-existence of decent and cheap hotels, cumbersome and risky transportation, and lack of sports and recreational facilities. More than two lacs people visit the holy shrines every year and spend between 10 and 20 million rupees.

The climate, topography, vegetal cover, perennial flow of streams, absence of other competitive fuels such as coal and oil are all very favourable factors for the development of water power in this region. According to the preliminary investigations by Kaushic³², the Garhkum region possesses a potential of about 11 million Kw (Table 8).

TABLE 8

<i>River basin</i>	<i>Estimated power potential in Kws</i>
Kaliganga-Sarda Basin (Western part)	300,000
Alaknanda Basin	6,00,000
Bhagirathi Basin	7,00,000
Yamuna-Tons Basin	1,00,000

It will require a team work of hydel-engineers and economists to locate suitable sites for power development in each basin, and do the cost-analysis. It is more economical to harness the affluents in this region. According to Kaushic, microgenerators of 4 to 10 kw capacity can be installed at most of the watermills. These small power stations will have full safety and economy.

At present two projects are under construction. One is on the Yamuna near Dakpathar and the

other on the Ramganga at Kalagarh. The details of the Yamuna Hydel Scheme are as follows :

TABLE 9

<i>Name of the Project</i>	<i>Installed capacity (MW)</i>	<i>Irrigation capacity (Lac acre)</i>	<i>Remark</i>
1. Dhalipur-Dhakrani Yamuna Stage I	84	—	completed
2. Kishan Dam Project	450	6.7	under construction.
3. Yamuna Stage II Part I	240	—	—do—
4. Yamuna Stage II Part II	120	—	—do—
5. Biyasi Dam Project	75	—	under investigation
6. Lakhwar Dam Project	150	—	—do—

The important towns of the region have been electrified by small local electricity generating stations, both hydel and diesel (Table 10).

TABLE 10

<i>Nature of Power Stations</i>	<i>Location</i>
Hydel	Mussoorie, Naini Tal, Bageshwar, Champawat.
Diesel	Dehra Dun, Dhakrani, Tehri, Pauri, Pithoragarh.

Some of the towns are connected with the Sarda Hydel Power line, such as Almora, Naini Tal, Bhowali, etc.

The mining activity is underdeveloped and the detailed exploratory work for minerals is yet to be undertaken. The absence of coal, inaccessibility and non-development of water power have retarded the development of mining in this region. Sugar mills are concentrated in various towns of the *Dun* of Dehra. Minia-

ture bulb factories, textile mills and lime kilns are some of the main industries of Dehra Dun city. Among the small industries of the city are teaprocessing, paper and pulp, and manufacturing of some scientific instruments. One sugar mill at Doiwala and an antibiotic factory at Virbhadra (Rishikesh) are the only big factories worth the name in the region. It is expected that the completion of the Yamuna Hydel Project will initiate a new era of industrialisation in the region.

It has already been mentioned that the region is rich in forests. The largest proportion of the area under forests is in the district of Uttar Kashi (83.9%), and is followed by Tehri (68.6%), Naini Tal (51.9%) and Dehra Dun (50%). Thus, the

forest-based industries can well be developed on an organised scale. Most of the cottage industries are directly related to the products of ringal bamboo, and forest products and livestock. The important household industries are wool weaving, basketry, rope-making, leather-working, carpentry, distilling country liquor, etc.

Transport and Communications

Though strategic importance of the northern frontiers has accelerated the development of transportation and communications in this region since 1962, yet the isolation in most parts is not broken. Horticulture and commerce have been stimulated wherever modern roads have rea-

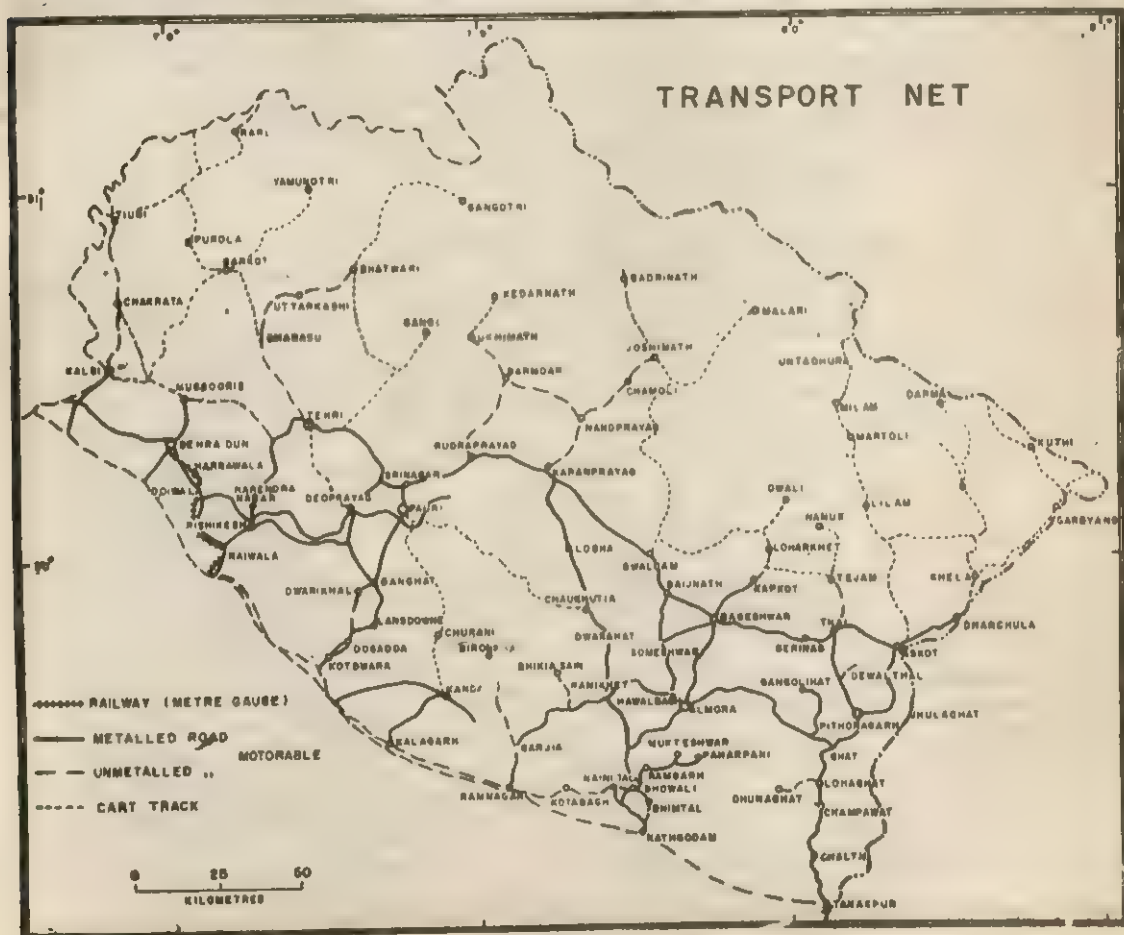


Fig. 10.17

ched. The existing transport arteries also perform an enormous task of handling a huge rush of pilgrims and tourists during the summer and post-monsoon periods.

From the Rishikesh railhead start two famous mountain roads, one to Badrinath and the other to Gangotri (Fig. 10.17). The first is motorable up to Mana (about 7 km beyond Badrinath). The road to Gangotri has been completed, but the bridge on Janhavi is not suitable for automobile up to Sonprayag. Recently, Kalsi-Lakhwar-Barkot road has been opened to automobile traffic and it has provided an alternative route to Yamunotri. After the construction of

a bridge on the Tons at Tuini, it will provide direct motor link between Mussoorie and Simla. This is complete on both the sides of the bridge. From Karnaprayag, one motor road has been constructed along the Pindar to connect Almora and Ranikhet in Kumaon. The easternmost road of this region starts from Tanakpur railhead towards Lipulekh pass. The road follows the Kali valley. From Kathgodam railhead starts another road to Naini Tal, Ranikhet, Almora and Kausani. Thus, a network of roads is developing fast in the region, originating from the main road and railheads in the plains. However, the roads are liable to be blocked by landslips

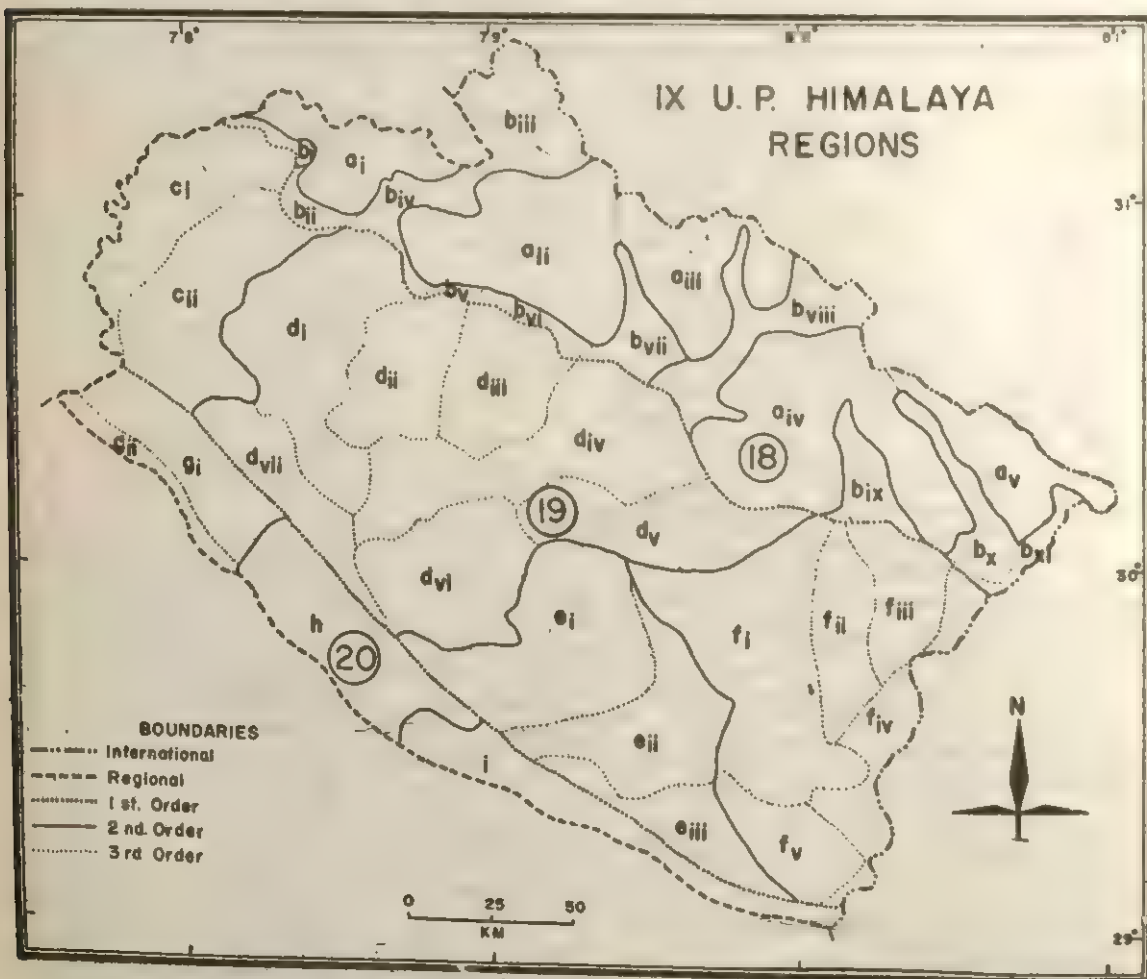


Fig. 10.18

or landslides during the rainy season. No air services are available in the region excepting for military purposes.

The Regions

The region is a mosaic of small regions and any regionalisation on a workable scale is likely to be somewhat arbitrary. In Garhkum, cultural areas are generally defined by river valleys, and water partings in general represent boundaries between different areas. The more rugged character of Garhwal presents striking contrast to the milder aspect of Kumaon which as such has a more progressive economy. The bleakness of rugged Pindar valley can be contrasted with the verdant Mandakini valley at sub-regional level. The people of the upper Tons basin (Panchagain and Fatehparbat *pattis*) claim their descent from the Kaurava king, Duryodhana³⁹ and worship him as God, whereas the people in Yamuna basin practise fraternal polyandry and associate them-

selves with the Pandavas. Similarly, the Dhawal-ganga valley is inhabited by Bhotiyas, having a completely different cultural pattern. The confluences represent the contact zones of different valley cultures.

Based on broad and generalised aspects, the Garhkum Himalaya has been divided into three first order, nine second order and thirty five third order regions (Fig. 10,18). An attempt has been made to combine the traditional tripartite classification of the Himadri (Greater Himalaya), the Himanchal (Lower Himalaya) and the Siwalik (sub-Himalayan Tract) with intervening river basins and the altitudinal zones. The foregoing account of different cultural features like population density, settlement types, agriculture and animal husbandry, etc. makes it clear that there is a remarkable adjustment of these elements to the altitudinal zones. The following regions have been outlined on the basis of the above-mentioned criteria :

18. Himadri

(a) Himadri Ranges

- (i) Bandarpunch Block
- (ii) Gangotri-Kedarnath-Badrinath Block
- (iii) Kamet-Hathiparvat Block
- (iv) Dronagiri-Nanda Devi-Trisul Block
- (v) Lipulekh-Kalapani Block

(b) Himadri Valleys

- (vi) Upper Tons Valley
- (vii) Upper Yamuna
- (viii) Janhavi Valley
- (ix) Upper Bhagirathi Valley
- (x) Upper Bhillanga Valley
- (xi) Upper Mandakini Valley
- (xii) Vishnuganga Valley
- (xiii) West Dhauliganga Valley
- (xiv) Goriganga Valley
- (xv) East Dhauliganga Valley
- (xvi) Upper Kaliganga Valley

19. Himanchal

(c) Tons-Yamuna Basin.

- (xvii) Eastern Tons Basin
- (xviii) Yamuna Basin

(d) Bhagirathi-Alaknanda Basin.

- (xix) Bhagirathi Basin
- (xx) Bhillanga Basin
- (xxi) Mandakini Basin
- (xxii) Alaknanda Basin
- (xxiii) Pindar Basin
- (xxiv) Nayar Basin
- (xxv) Ganga Basin

(e) Ramganga-Kosi Basin.

- (xxvi) Ramganga Basin
- (xxvii) Kosi Basin
- (xxviii) Gola Basin
- (f) Sarju-Kali Basin
- (xxix) Sarju Basin
- (xxx) Raganga Basin
- (xxxi) Goriganga Basin
- (xxxii) Kali Basin (W)
- (xxxiii) Ladhiya Basin

20. Siwaliks

- (g) Yamuna-Ganga Tract.
- (xxxiv) Dun valley (Dehra Dun)
- (xxxv) Yamuna-Ganga Tract
- (h) Ganga-Ramganga Tract
- (i) Ramganga-Kali Tract

Himadri comprises the great Himalayan zone having a width of about 50 km with mean relief between 4,800 and 6,000 m. The region is divided into two second order divisions : (a) the Himadri Ranges and (b) the Himadri Valleys. The Himadri ranges occupy the highest position covering the northern part of the U.P. Himalaya. Most of this region remains snow-clad without any habitation. The five groups of peaks of the region have been separated by transverse gorges of the Bhagirathi, the Vishnuganga, the West Dhauliganga, the Goriganga and the East Dhauliganga respectively.

The Himadri valleys comprise the deep gorges of the rivers garlanding the high peaks of the Himadri. The main valleys are the Tons, the Yamuna, the Janhavi, the Bhagirathi, the Bhilanga, the Mandakini, the Vishnuganga, the West Dhauliganga, the East Dhauliganga and the Kali, each with its own type of culture. Various types of transhumance are practised in these valleys. The valleys of the Dhauliganga (both west and east), Goriganga and upper Kali accommodate the largest number of Bhotiyas, the chief nomadic tribe of the region. Malari, Telam, Milam Martoli, Ralam, Lilam, Munsiri, Garbyang and Khela are the important localities where the Bhotia tribes are well-concentrated.

Himanchal : With an approximate width of 75 km, the Himanchal is a massive mountain tract in between the Central Himalayan thrust in the north and the main boundary thrust in the South. The average relief of ridges in this region varies between 1,500 and 2,700 m, while the valley bottoms range between 500 and 1,200 m. The region is characterised by a variety of landscapes. Considering the river valley as a representative of one culture and the water divide as a boundary between two cultures, the whole region has been divided into four 2nd order regions. These are : (c) Tons-Yamuna basin, (d) the Bhagirathi-Alaknanda basin, (e) the Ramganga-Kosi basin, and (f) the Sarju-Kali basin.

The Tons-Yamuna Basin lies in the westernmost part of the Himanchal region. Administratively, the basin comprises parts of the tahsils of Purola and Rajgarh of Uttar Kashi district,

and Tehri, Chakrata and Dehra Dun. The more rugged character of the upper part of the basin is in striking contrast to the milder aspect of the lower part. The region, covering most of the part of the Jaunsar Himalaya has its own traditions and cultures and there is a little modification in the social set-up and mental horizons of the people in recent years.³⁴ Intermittent cultivation is practised on fairly steep hill-sides whereas dry and wet farming are prevalent on the upland slopes and in the low-lying valleys respectively. The region has three towns, i.e., Chakrata, Mussoorie and Landaaur. It is further divided into two 3rd order divisions : (i) the Tons Basin, (ii) the Yamuna Basin, following the water-parting with its highest peak of the Kidarkanth (3,813 m).

The Bhagirathi-Alaknanda Basin forms the largest region of the area covering partially the tahsils of Bhatwari, Dunda (Uttar Kashi), Pratapnagar, Tehri, Devprayag (Tehri), Ukhimath, Chamoli, Karnaprayag (Chamoli) and Pauri and Lansdowne (Pauri). The region is well-connected with motorable roads following the river valleys which are thus comparatively well-developed, economically and culturally. The ancient holy route to Kailash and Mansarovar passes through these valleys. Now, various holy places like Badrinath, Joshimath, Ukhimath, etc. have been connected by motorable roads. This region may be called the heart of the Garhwal region. Based on river valley culture concept, the basin has been further sub-divided into seven 3rd order regions. These are : (i) the Bhagirathi basin, (ii) the Bhilanga basin, (iii) the Mandakini basin, (iv) the Alaknanda basin, (v) the Pindar basin, (vi) the Nayar basin and (vii) the Ganga basin. A number of towns are well-developed in the region : Uttar Kashi, Tehri and Devprayag in the Bhagirathi basin; Pauri and Srinagar in the Alaknanda basin; Lansdowne in the Nayar basin and Narendra Nagar in the Ganga basin, all developing as nodal service centres.

The Ramganga-Kosi Basin, the heart of the Kumaon region, comprises parts of the tahsils of Karnaprayag (Chamoli), Pauri and Lansdowne (Pauri), Ranikhet and Almora (Almora), and

Naini Tal. The region is well-connected by roads with the plains as well as with the interior parts of the hills. Agriculture is the main occupation. Dwarahat and Someshwar are two important historical centres which flourished during the reign of Katyuri and Chand rulers. Ranikhet, Almora, Naini Tal and Bhowali are the urban centres of the region. The region is well-known for the orchards of apples, pears, apricots, plums, citrus fruits, etc., which bear the future trade mark of Kumaon. The fruit-belt of Ramgarh, Mukteshwar, Paharpani and also of Chaubatia, produces varieties of fruits. Bhowali is the main fruit-collecting and exporting centre. The Ramganga Valley is densely populated and is well-connected with the Pindar valley by a motor road via Gwaldam. The region is divided into three third order regions : (i) the Ramganga Basin, (ii) the Kosi Basin, and (iii) the Gola Basin. In population density, the Kosi valley is next to the Ramganga. Most of the area of the Gola valley is forested. However, the lake region of Bhim Tal—Naukuchiya Tal area and lower Gola valley is densely settled.

The Sarju-Kali Basin : Lying in the eastern part of the region, the Sarju-Kali basin comprises parts of the tahsil of Almora and Champawat (Almora) and the whole of Pithoragarh district. An ancient route to Kailash and Mansarovar passes through this region. Some of the ancient ruins are still located in Baijnath, Bageshwar, Jageshwar and Champawat which has been the ancient capital of Chand rulers of Kumaon. The valley of the Sarju is more fertile and agriculturally more developed. The east-west Kapkot-Tejam-Dharchula line marks two distinct regions : The northern region is more rugged and lofty and hence a few small settled pockets. The Bhotiyas and other tribes are the main inhabitants of these high valleys. A border road starting from Tanakpur rail-head passes through Champawat, Lohaghat, Pithoragarh, Askot and Dharchula. Apart from this, many branch border-roads have recently been constructed. The mid-valley of the western Kali, comprising Pithoragarh tahsil is densely populated. Dharchula, Jhulaghat and Pancheshwar are the

main ferry centres on the Kali river for entering Western Nepal and have developed as the main centres for business with Nepal. The northern part of the region comprising Pithoragarh district is progressing well after the Chinese aggression with Pithoragarh as the main centre. Lohaghat is another small town. On the basis of traditional customs and social set-up as well as local dialects, the region is divided into five 3rd order regions : (i) the Sarju basin, (ii) the Ramganga basin, (iii) the Goriganga basin, (iv) the Western Kali basin and (v) the Ladhya basin.

The Siwaliks : Starting from the foot-hills in the south to the main boundary thrust in the north, a long and narrow chain of low hill ranges stretches NW-SE following the general trend of the Himalaya. These ranges are remarkably of even crest line between 750 and 1,200 m. While the northern slopes are profusely forested and descend gently to the flat-floored structural valleys called *duns*, the southern slopes are steep. The region is divided into three 2nd order regions : (g) the Yamuna Ganga Tract, (h) the Ganga-Ramganga Tract, and (i) the Ramganga-Kali Tract.

The Yamuna-Ganga tract is further divided into two 3rd order regions : (i) Dehra Dun and (ii) a narrow southerly chain of the Yamuna-Ganga Tract. The duns have been filled up by recent gravels upto a height of 350 m. The Dehra Dun is about 75 km long and 25 km wide. It rises from 360 m along the Yamuna and the Ganga to 660 m in the middle and to 900 m near the foot-hills. The entire valley is drained by the river Song. It is the most fertile, well-irrigated and densely populated valley of the region. However, much of the area is under dense forests. Dehra Dun is the biggest city of the U.P. Himalaya. Other urban centres are Raipur, Clement Town and Rishikesh. Dehra Dun and Rishikesh are the rail-heads having connections with the main hill-roads. Other notable service centres are Raipur, Choharpur, Ambari and Arcadia. The duns of Kohtri, Chokhamba, Patil and Kota are very small in size with little development.

A narrow chain of foot-hills between the Dehra Dun and the Upper Ganga Plain is a region of low

foot hills; which is mostly forested. The Ganga-Ramganga tract comprises the southern part of Lansdowne tahsil and the Ramganga-Kali tract covers the northern part of Haldwani tahsil of Naini Tal. Most of the region is covered with dense sal forests. Agriculture is practised only in small patches in forest clearings and the settlements are either scattered or compact in small groups. Dogadda and Kotdwara are small service centres in the Ganga-Ramganga Tract. Ramnagar, Kathgodam-Haldwani and Tanakpur are the main urban centres of the Ramganga-Kali Tract. These are gateway-towns and are well-connected with interior parts of the hills.*

Problems and Prospects

Here, as elsewhere, the decisive factor in resource evaluation and development are the people. If the Garhkum people have to work for a bright future, the possibilities are ample. As the recently instituted Hill Development Board plans, it is important to have a full inventory of the regional resources and to evaluate the different potentials, region by region. The region is endowed with vast resources of forests, scenic beauty, agriculture, industry, horticulture, livestock, minerals and above all, the sturdy and painstaking people with rather a proud heritage and advanced culture.

Actually the region reflects all the problems of under-development in an acute form. The potential of resources, both human and physical, have not been developed, rather they have suffered from utter neglect till 1962 when the Chinese

aggression attracted the attention of the administrators and politicians on account of its strategic importance. Now the economy of the region needs to be strengthened with full vigour and skilful resource planning. The development depends upon the construction of roads, setting up of hydro-electric power stations, establishment of agro-industries based on forest, horticulture and livestock, and tourism on a scientific basis.

There is a prime need for the conservation of its natural resources. Limestone and gypsum reserves are quite sufficient to justify the setting up of a cement factory either at Kalsi or Rishikesh and near Kaladhungi. Pithoragarh and Tehri districts have good deposits of copper ore. In fact, copper industry flourished during the Gurkha rule at many places in Pithoragath, such as at Askot, Gangolihat, Sira, etc. Keeping in view the migratory habits of the Gujjars it is essential to set up co-operative dairies at suitable points and they should be helped to construct two sets of permanent habitations for different seasons.

During the British period, a survey work was completed for the construction of a railway line from Rishikesh to Karnaprayag along the Alaknanda, but the project was shelved on account of World War II. Uttar Kashi (1,150 m) and Chamoli (950 m) are located at lower elevations and it is not difficult to connect them with narrow gauge railway lines. A railway line can be constructed along the Kali valley also, connecting Tanakpur and Dharchula. The region possesses sufficient resources of water power which can be utilized for electric traction. Huge rush of pilgrims for six months (May to October) can provide sufficient revenue to make it economical. Ropeways can also be developed in certain suitable localities.

* These towns are located just on the border of the U. P. Himalaya region and Upper Ganga plain region, except Dogadda and have influenced the economy of the region.

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The Eastern Himalaya ($26^{\circ}40'-29^{\circ}30'N$ and $88^{\circ}2'-97^{\circ}5'E$) covers an area of approximately $122,802 \text{ km}^2$ comprising the Kingdoms of Sikkim and Bhutan and North-East Frontier Agency (excluding Tirap and part of Lohit frontier district lying south of the Lohit river) and Darjeeling district (excluding Siliguri sub-division) of W. Bengal (Fig. 11.1). Although the region is a distinct physical entity, it has substantial political and cultural diversity. In the north, the *Himadri* marks the international boundary with Tibet which corresponds with the internationally accepted, well-known McMahon Line in the north-east (east of Bhutan the line extends over 3,520 km), following in general the principle of watershed which is in most places the crest of the Himalayan mountains. While in the west the Singalila range separates Nepal, in the east and the south-east Assam-Burma ranges and Lohit river respectively delimit the region. The

southern limit is marked by 150m contour separating the region from Assam Valley. Although Sikkim, Bhutan, Darjeeling and NEFA differ in size, population, natural resources, economic development and structure of society, their politico-geographical problems are similar in many ways, arising as they do from the same geographical setting. The region frequently faces complex political and administrative problems which are further aggravated by the rugged topography of the Himalaya, which has so far obstructed the unification of the people of different parts. The Eastern Himalaya which was till recently a political back-log, Tibet being a buffer region between India and China, calls for greater attention and understanding not only for defence and strategy which are so vital to us, especially after Chinese aggression (1962), but also from the point of view of social and cultural integration with the rest of the country through

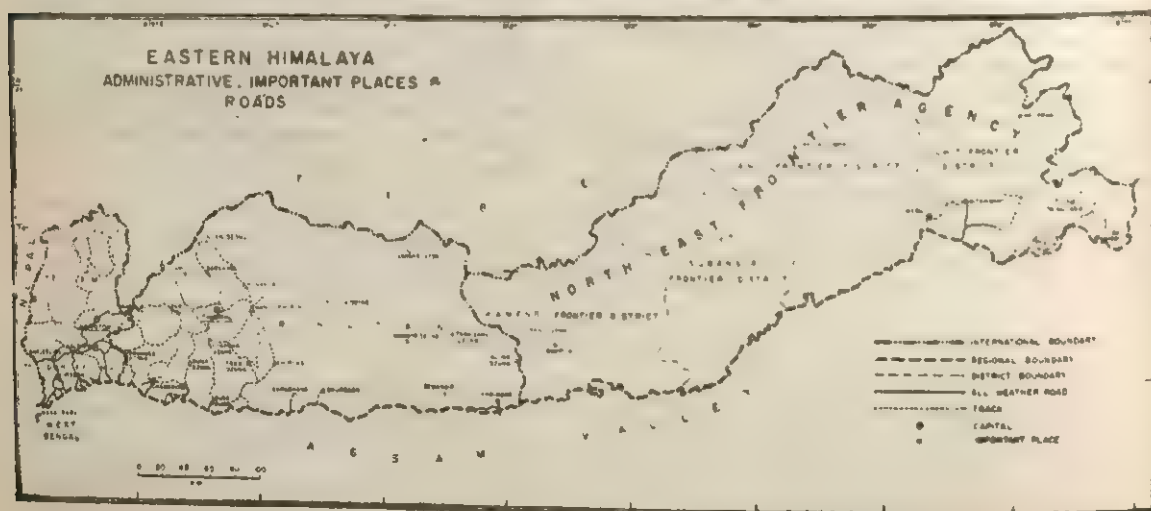


Fig. 11.1

economic development in general and improvement of accessibility in particular.

Historical Background

The history and culture of all the four distinct political units of the region have been constantly governed by its harsh natural environment.

Sikkim of today came into being as a political entity in 1641; it was larger in area in its early years when it included the Ilam district of Eastern Nepal and the Chumbi valley of Tibet and the Ha valley of Bhutan, its southern boundary reaching up to the *duars*. In 1835 the lower area including the Darjeeling and Kalimpong districts was presented to the Government of India. However, Sikkim remained an independent Kingdom. In 1950, a new treaty was signed which makes India responsible for Sikkim's external affairs (political, economic and financial), defence and strategic communications. A representative of the Government of India is posted in Gangtok to maintain effective liaison.¹

The location of Bhutan between the Tibetan Plateau and Assam-Bengal plains of India, gives it a highly strategic importance. The Kingdom's historical background is lost in the mists of antiquity and the only available records date back to the end of the 18th century. Since 1907, Bhutan has been ruled by a king. However, the feudalistic pattern there is gradually changing.

Bhutan's undemarcated traditional boundary with Tibet is fully established and recognised by history as well as customs. For the most part, it follows the crest of the Himadri. Between the Chomolhari and Kulakangri peaks it follows approximately the watershed. To the southwest of Chomolhari the western slopes of the Khungdugang mountain and the Merug La (pass) separate Bhutan from the Chumbi valley, now of Tibet. To the north of Merug La the Torsa river cuts across the international boundary. Similarly, the international boundaries are established traditionally in north-east with Tibet, and in the east with North East Frontier Agency of India. Until the turn of the twentieth century Bhutan, although a political entity, had no central government.

It was split into a number of smaller divisions along feudalistic lines; every seat of power was subject to a continuous contest with the other unscrupulous chiefs who aspired to the domination.² Recently Bhutan has changed its isolation policy but still it has to go a long way to achieve national integration.

The NEFA (also as Arunanchal) forms more than half of the whole region. The Agency was formed in 1954 out of the former Balipara frontier tract, Abor and Mishmi hills and Tirap frontier tract of Assam State. The Agency is constitutionally a part of Assam. The territory is now specially administered by the Governor of Assam acting as the agent of the President of India.

The south-western corner of the region comprises of Darjeeling district (excluding Siliguri sub-division) of West Bengal. The district is situated on the flank of the Himalaya and is famous for its grand and varied scenery. During the British period special care was taken to develop the hill stations of Darjeeling, Kurseong and Kalimpong, and side by side also came up the tea plantations.

The Himalaya always provided India with natural defence and the Eastern Himalaya were regarded as the safeguard against the invaders from the north-east until the rise of China as a power since Indian Independence.

The first important move by China was the military annexation of Tibet and the expulsion of Dalai Lama. The complete annexation of Tibet in 1959 brought the two countries face to face at the eastern as well as western ends of the Himalaya, while the buffer States on the southern margin, i.e., Nepal, Sikkim and Bhutan also felt the pressure of the Chinese aggression. As a result of conflicts since October 1962, the once quiet north-east border has become an active frontier.³

Culturally, the region has been linked with the plains since remote times though the evidences of hostility and resentment too are available. At the same time, however, there has long been a tradition of trade and mutual friendliness between the tribes of the foot hills and beyond (Tibet) and the people of the Brahmaputra valley and the Lower Ganga Valley through the Chumbi Valley.

The Physical Setting

Not much detail is known about the geography and geology of the Eastern Himalaya. There are three salient features of the Himalayan geological structure. Firstly, there is the great elevation of this mountain system, in particular its crystalline axis, whence the altitude and its train of consequences. Secondly, the soft rock areas have been directly excavated by subsequent streams to form longitudinal valleys, some of which have become ribbons of settled life. Areas of soft rock have also contributed indirectly to the deepening of valleys heading to great contrast of high peaks and steep slopes. Lastly, there is preponderance of length over breadth of this mountain system, which enabled man at an early date to penetrate a chain that could not be skirted; this factor led to comparatively early settlement and cultivation in the region despite the obstacles of altitude and topography.⁴ The early settlers penetrated into the region through a number of difficult passes in the north and the *duers* in the south, which has resulted into the mixed cultures of Indo-Mongoloid as well as Indo-Tibetan people. The Chumbi valley, separating the Kingdoms of Sikkim and Bhutan may be said to be the principal route used for spreading Buddhism also in Tibet. The passes of the Great Himalayan wall, which is characterised by lofty serrate ridges, cirque-indented slopes, and sharp peaks produced by glacial action, recently became the doorways for the Chinese. Some of the famous passes along the NEFA border are Thag La, Tulung La, Dom La, Andra La and Kaya La.

According to the observations made by Swiss geologist Augusto Gansser during the spring of 1963, the Eastern Himalaya can be divided into four structural units.

- (i) The Sub-Himalaya consists of Siwalik sediments of the Tertiary period lying mostly in southern part of the region,
- (ii) the Lower Himalaya lying between the main boundary fault and the main central thrust comprises varied sedimentary and metamorphic rocks ranging in age from Palaeo-

zoic to Mesozoic. The tectonics of this zone are hardly known,

- (iii) north of the central thrust lies the basal crystalline thrust sheet of the higher Himalaya; and the syntaxial bend at Namcha-Barwa peak (7,750 m), and
- (iv) a great thickness of fossiliferous Tethys sediments cover the crystalline thrust sheet of the higher Himalaya.⁵

Geologic structure and processes of erosion influence the surface appearance of landforms, which are intricately related to man's use of the land. But in this part of the world the natural environment has remained inhospitable where adverse surface features have seriously impeded human development over large areas.⁶

In the western part of the region Sikkim is enclosed between Singalila and Donkhya ranges. In its north the central basin is cut off from Tibet by the broad convex arc of the Great Himalayan peaks, built-up of crystalline rocks, in which the Tista river rises. To the south it is blocked by the resistant rocks of the Darjeeling ridge through which the Tista has carved a deep, narrow gorge running west of Kalimpong (Fig. 11.2).

The horizontal character of the Himalaya is more obvious towards the east of the region and three lateral belts of Greater Himalaya, Lesser Himalaya and Outer Himalaya can be seen in Bhutan and NEFA.

The Great Himalaya in the north of the region consists of snow-capped ranges (above 7,000 m.) and high valleys running down from the great northern glaciers. These ranges separate the complicated structure of the Himalaya from the flat or undulating table land of Tibet. Spurs from the Great Himalaya radiate southward forming water sheds such as the Black Mountain range which forms the watershed between the Sankosh and the Manas rivers and divides Bhutan into two parts both administratively and ethnologically. This part of the Himalaya comprises of several fertile valleys like Paro valley in Bhutan and Kamla valley in the NEFA. The valleys are located at elevations varying from 3,000 m to 4,000 m which with their dividing ranges, extend southward for 60 to 70 km.



Fig. 11.2

Going towards the east, the ridges more often turn to north-south. This is in line with the general change of direction in the axis of the mountains around the Sino-Indian-Burma Plateau. The outer hills of the Siang or the Dibang river, are comparatively small and of unimpressive height, the bigger ridges and peaks being found further in. The extent of the plain area is greater in the Lohit river basin which marks the south-eastern boundary of the region.

The Siwalik type hills rise to a height of 300 m or so in a series of knife-like ridges from the plains of Assam up to 10-15 km northward. This is called the *Dhars* in Bhutan. The mountains rise sharply and abruptly from the narrow *Dhars* and are cut into deep gorges by rivers liable to sudden floods. The narrow strip of the *Dhars* contains access to the 18 strategic *Dhars* (doors or passes) through the Himalayan foot hills leading into the mountainous central Bhutan. The characteristic Siwalik formation is found along the greater part of southern NEFA up to the point where the mountains curve around the valley head. At this point the sharp definition of the Siwalik ridges loses its typical character and is replaced by a series of low hills with easier slopes, which gradually merge into the higher mountains of the Himalayan range.

The whole region is dissected by numerous rivers and their tributaries (Fig. 11.2). The great Brahmaputra basin forms a natural drainage for the rivers and streams flowing down from the Himalaya. Most of the inhabited areas of the region lie either in these valleys or valley slopes. The rivers show marked characteristics of mountain streams. They flow between high rocky mountains and join the stream in steep precipices, confining the channel in a narrow valley. The streams are not navigable because of their gradient. Some of the important rivers of the region are the Tista in Sikkim and Darjeeling; the Torsa, Wong Chu, Mo Chu and Manas in Bhutan; and the Dihang, Kamla, Subansiri and Siang in NEFA.

Land slides are frequent and their occurrence is accentuated by frequent earthquakes, as the whole of Assam is in seismic zone.

Climate

Owing to rapid changes in topographic and altitudinal aspects, the climatic conditions tend to change within short distances. There is a contrast in temperature and rainfall between the sheltered valleys and the foot-hills and mountain tops.

The pre-monsoon showers begin towards the end of March, the monsoon proper lasting from

Natural Vegetation

The diverse nature of the climate and soil is reflected in the flora of the region. The forest types range from tropical evergreen in the foothills, through temperate evergreen in the middle ranges, to the coniferous in the higher elevations and the high Himalaya in the extreme north (Fig. 11.3, Inset).

Tropical rainforests, confined to the foothills and plains, are the typical three-storied forests, containing either a few species or one or two predominating species in the upper canopy. Examples of the former are the Hallong-Makai (*Dipterocarpus Macrocarpus-Shorea assamica*) forests, and of the latter, the Hollock (*Terminalia myriocarpa*) forests. Altitudinal aspects play an important part in the distribution and nature of vegetation in the mountain areas. Here, unlike the western Himalaya, conifers are found mixed with broad-leaved species to a large extent, the purer conifer forests occurring only at the higher elevations. On the drier western side the vegetation from 2,700 m to 4,300 m is a growth of shrubby junipers with pine, silver fir, dwarf rhododendrons and wild straw berries, while above 4,600 m Himalayan meadows are seen until the perpetual snow line is reached.

The unexploited rich forest resources have suffered from fires and from reckless fellings and burning for *jhuming* (shifting cultivation). At places, especially near the population centres, the mountains are largely deforested and covered with secondary growth.

The Physical Resource Base

Forests and hydel power provide two most important resource potentials of the region, although the ruggedness of the terrain and harsh natural environment have restricted their use so far.

In the region, the pure stands of commercial species do not occur in sufficient concentration to allow large scale logging. Recently a Swiss company offered some technical assistance to develop a paper pulp industry in Bhutan, which has not materialized so far. Bhutan has established a department of forestry which will carry

out surveys and plantation of sal and teak in the area. Bhutan possesses tremendous resources for the forest-based industries, especially such as matches, wood working and the new industry of medicinal herbs of which no commercial exploitation has been done so far. As regards the mineral resources, the Geological Survey of India (1962-63) has found extensive deposits of coal, copper, dolomite, graphite, gypsum and limestone in Bhutan.

Sikkim also has dense original forests and valuable plantations of sal, *simal* and bamboo, which are generally unexploited. Because of the difficulty of transportation in the northernmost region of Sikkim, where some of their finest forests lie in Lachen and Lachung areas, the exploitation has been difficult. Since 1960, the Sikkim Mining Corporation, a joint undertaking of the Government of India and Sikkim, has done pioneer work in the field of mineral exploitation. Mineral surveys by the Geological Survey of India have revealed appreciable quantities of copper, lead and zinc.

The forest resources of NEFA are also unexploited because of similar reasons. The Forest Department has started launching new economic plantations such as tea and pine apple.

There are great potentials for hydel power. The harnessing of various rivers and streams started in NEFA during the Second Five Year Plan, when several generating sets were installed at different places in the territory. Draft reports of three microhydel projects at Tezu in Lohit, Pasighat in Siang and Bomdi La in Kameng have also been completed. In 1961, Bhutan and India signed an agreement to harness the Jaldhaka river for hydro-electric power. In addition to this project, the Central Water and Power Commission of the Government of India has undertaken surveys of Wongchu and Amochu rivers in Western Bhutan. The Thimbu power house with 400 kw capacity was completed in 1966. If, however, the hydro-electric power can be generated on a large scale in Sikkim, it is possible to supply electricity to adjoining areas in India, thereby greatly augmenting the financial resources of the Kingdom.

The region also abounds in scenic beauty which can attract tourists from all over the world but the lack of political as well as transportation accessibility in the region is a restrictive factor. In the whole region only Darjeeling has developed as a fashionable hill station and commands the modern transport facilities and infrastructures. Kalimpong and Kurseong are less developed but are charming tourist attractions.

The Cultural Setting

Population and Settlement

With a total population of 1,791,503 (estimated in 1961) persons the Eastern Himalaya is one of the most sparsely populated areas with an average density of 14 persons per km². Over the centuries, the narrow fertile valleys and the arable hill-sides of the Himalaya have been populated by hardy Indo-Mongoloid, Tibetan or Nepalese people who have adapted themselves to the rugged terrain and the rigorous climate. Mongoloid tribes from Tibet, Indo-Aryan people from north India, and the Lepchas from Assam and Upper Burma have settled in the Himalayan valleys and developed distinct cultural patterns. The physical features are responsible for the little mingling among the peoples of the different tribes.⁸

One of the major problems of the population lies in the lack of national consciousness among the people and geography favours the retention of local identity which is further aided by difficulties of transport and communication. To the people the tribal loyalties come first and national allegiance comes second. The main problem of the population patterning is related to its uneven distribution and confinement to some of the river valleys.

The general pattern of the population distribution follows the physical and climatic zones from north to south, (i) the virtually empty great Himalayan region in the north, (ii) the zone of relatively settled country in the middle Himalayan valleys and (iii) the relatively more densely settled southern zone characterized by a scattering of population clusters.

The uneven distribution of population among several small valleys without adequate commu-

nication with each other hinders cohesiveness among the people. The productive land is limited to clearings in the narrow rugged mountain valleys and the settlement pattern, consists of dispersed hamlets on the lower slopes above the cultivated land. Agglomerated settlements in the form of small rural villages with about 15-20 houses are found isolated from one another in the lower and middle Himalayan region.

In the absence of vital statistics, particularly birth and death rates, it is difficult to forecast the population trends.

Most of the population of the region is rural and the nature of population as well as their settlement patterns are highly influenced by physical factors, local resources and economic condition. The settlements are small and widely dispersed over much of the region. The environment is responsible for the multiplicity of languages (mostly dialects) and customs of the tribes, which did not get any chance to mix with the neighbouring ones. Apart from the diversity of languages, illiteracy is almost universal in the region.

The general pattern of the settlement very much depends upon the three lateral physical and climatic zones. The northern border has been greatly influenced by the Indo-Tibetan cultures. For the past many centuries the Tibetans have crossed these borders to trade with the people of this region. Their impact is visible not only in the large number of Buddhists among the tribes, but also in their way of life. The villages are well organised and the houses are generally built of stone walls with timber or thatch roofs.⁹ Except for the glaciated parts of north Sikkim and Bhutan, as one moves along this belt from west to east the population becomes thinner. At the extreme east, in the Lohit Division, the region is inaccessible with hardly any settlements.

The southern belt of foothills has had similar contact with the Assam plains and the influence of the culturally advanced people is visible in the language, clothes, techniques of agriculture and food habits.

Except Darjeeling, which has already developed as a big urban centre and holiday resort, some

other towns are speedily developing in Sikkim, Bhutan and NEFA, such as, Gangtok—the capital of Sikkim; Paro, Punakha and Thimbu in Bhutan; Bomdila, Tawang, Sela, Dirang, Dzong, Bameng, Ziro and Pasighat in NEFA.

Culturally the middle belt is quite backward. Tribes living in this region have had little contact with the outside world and even to this day exist in extremely primitive conditions. In most parts, particularly in the Subansiri, Siang and Lohit districts of NEFA and the valleys of central Bhutan, dwellings are scattered and people live in small hamlets (5 to 10 houses) scattered over a large territory. The dispersed settlement consisting of a group of isolated farmsteads is the characteristic feature of this area. The farmer generally makes his house on the hillside above

the land he cultivates. The same sort of settlement pattern is seen in Sikkim Himalaya where the dwellings have a tendency to cluster around the monasteries. Gangtok in the heart of this Kingdom has become an administrative as well as commercial centre because of easy accessibility it commands.

The maximum percentage of population consists of tribal people throughout the region. The only non-tribal people are either businessmen or the Govt. employees. Little is known of the people of Bhutan and Sikkim but a wide literature on NEFA tribes is available which includes the survey conducted by the Government of India.¹⁰ According to the Techno-Economic Survey of NEFA, the local population consists of 82 Indo-Mongoloid tribes and sub-tribes.

Distribution of Tribal Population in NEFA¹¹

Tribe	Tameng Frontier District		Subansiri Frontier District		Siang Frontier District		Lohit Frontier District		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%
1. Dafia	25,245	44.6	35,025	60.5	..	..	..	..	60,270	20.0
2. Monpa	21,985	38.8	..	..	..	..	..	..	21,985	7.3
3. Aka	2,257	3.9	..	..	..	..	..	..	2,257	0.7
4. Miji	2,080	3.7	..	..	..	..	..	..	2,080	0.7
5. Sher-dukpen	1,154	2.0	..	..	..	..	..	..	1,154	0.4
6. Sulung	1,121	2.0	441	0.8	..	..	..	..	1,562	0.5
7. Bangru	983	1.7	681	1.1	..	..	..	..	1,664	0.5
8. Tagin	227	0.4	8,419	14.5	15,878	15.6	..	..	24,524	8.1
9. Apa Tani	..	..	10,909	18.5	..	..	..	..	10,909	3.6
10. Hill Miri	..	..	1,859	3.2	..	..	..	..	1,859	0.6
11. Adis	..	..	..	..	77,208	76.0	3,069	10.1	80,277	26.6
12. Memba & Khamba	..	..	..	..	3,109	3.1	..	..	3,109	1.3
13. Mishmi	..	..	..	..	380	0.4	21,970	72.4	22,350	7.4
14. Khamti	..	..	..	..	..	..	2,556	8.4	2,594	0.9
15. Singpho	..	..	..	..	..	..	373	1.2	373	0.3
16. Wancho	..	..	..	..	..	..	..	..	..	..
17. Nocte	..	..	..	..	..	..	..	..	..	..
18. Tangsa	..	..	..	..	..	..	..	..	..	..
19. Others	1,689	2.9	603	1.1	4,963	4.9	2,376	7.9	9,795	3.4
	56,741		57,937		101,538		30,344		250,162	83.07

Tirap Frontier District is excluded and whole of the Lohit Frontier district is included in the table.

The Buddhist and Lamaistic religion and culture are found throughout the region with the exception of Darjeeling district of West Bengal which comprises the people of various races and religions. The district is very thickly populated with a density of 210 persons per km² (1961) and has more than 13% of urban population.

Economy

In the region about 90% of the population earns its living by practising a primitive type of agriculture, which has traditionally been the mainstay of the economy since earliest times. Farming has been influenced by the nature of the terrain and the diversity of climate. Mineral and forest resources have not been so far exploited on any commercial scale. The mighty streams are a significant potential resource of hydroelectric power.

The shifting or *jhuming* cultivation is popular in the forested parts. In the valleys the cultivators lay out land in a terrace-like series, each terrace is divided and supported with a stone embankment and every field is carefully fenced with pine branches. Because of great variation in elevation, a variety of crops is grown.

In Sikkim, agriculture has been relatively more diversified and includes some commercial plantation and animal husbandry. Rice and corn are widely sown but cardamom, citrus fruits, apples and pineapples enter trade channels. Potato is an important crop sown at higher altitudes. Sheep, goats, cattle, yaks and mules are also plentiful and support the economy of high mountain valleys. Apart from supplying local needs, the pastoral industries furnish wool, skins, etc., for the market. The use of fertilizers and quality seeds has been introduced recently in collaboration with India for the improvement of agriculture.

The economy of Darjeeling is mostly based on its tourist industry and tea plantations.

In Bhutan, rice, buck-wheat, barley and wheat are sown widely. But the cultivation without proper manuring and prevailing soil erosion are responsible for low agricultural output. Pastoral activities are common. Yaks, sheep and goats are maintained in large number for their multiple

uses such as wool, meat, milk etc. The yaks are also used as beasts of burden.

Most of the valleys, particularly at higher altitudes, raise only one crop, as they remain snowcovered in long winters.

There is spatial variation in the variety of crops. In Kameng district in NEFA, *jhum* cultivation is not very popular, important crops there being barley, wheat, maize, millets, soybean and paddy; vegetables and chillies are also grown. The Subansiri district predominates in paddy, maize and finger millets while vegetables are rarely grown. In Siang district chillies, mustard, vegetables, etc., are grown near the foothills. Similar crop diversity is seen in Lohit also where at higher elevations wheat, barley and buckwheat are main crops, whereas rice, millets, potatoes and oilseeds are grown lower down. Horticulture has been developing in Teza where pineapple plantations are becoming successful.

The yield per acre in the region is low consequent upon primitive means of cultivation.

It is interesting to note that very little currency or money is used in this region. Barter system is still preferred here. The region can develop its economy by encouraging cottage industries and handicrafts in which the tribal people are quite talented.

Transport and Communications

Lack of transport and communications has been the major factor for the underdevelopment of the region. Special attention has recently been given to the speedy development of the means of transport and communication in view of their importance from both administrative and strategic point of views. In the whole region, only Darjeeling can be regarded as well-connected and accessible.

Before Sikkim launched its first Seven-Year Plan in April, 1954, there was only a 48 km motorable trunk-road between Gangtok and Rangpo on the Bengal-Sikkim border, and 200 km of other roads. This road kilometerage being insufficient, several jeep tracks in lower Sikkim and about 152 km of the north Sikkim Highway, connecting Gangtok with Lachen in north Sikkim, were cons-

tructed in 1954-62. This road facilitates movement of the forest produce, apples and potatoes from north Sikkim to markets in the lower parts. Bridle paths between Rishi and the Jelep-la, and Gangtok and the Nathula were also made jeepable. As a result of the road development almost all parts of Sikkim are now within easy reach from Gangtok. A nationalised State Transport Service operates on the important routes.¹²

Growth of means of transport and communication is essential for the security and economic development of Bhutan. The sealing of the border with Tibet in 1959 seriously upset Bhutan's economy and especially created a problem for disposal of the surplus rice. Lack of adequate means of transportation made its export to the markets in the plains below difficult and uneconomical. All this has led the Government of Bhutan to pay special attention to develop transport facilities for agricultural development and movement of essential building materials needed for developmental schemes. The completion of the 190 km road from Phuntsoling to Paro in west Bhutan by the Government of India in 1962 connected Bhutan and India by road for the first time. The State Transport, also established in 1962, now operates on this road between Phuntsoling, Paro and Thimbu. The development of other means of communication like post, telephone and

wireless are also receiving government attention. Recently two air-strips at Paro and Thimbu have been constructed.

In NEFA area there are six transport co-operative societies operating goods-cum-passenger services in the various parts of the territory, especially on routes like Namsai-Chowkham and Sadiya-Roing in Lohit district, Pasighat-Dibrugarh and Along—Sonarighat in Siang district, North-Lakhimpur-Hapoli in Subansiri district and Tejpur-Bomdila-Tawang in Kameng district. Limited road accessibility has led to the development of air transport for carriage of mail, cash, supplies, etc. There are four air strips in NEFA, out of which only two are suitable for Dakota landing. In a few places supplies have to be airdropped.

The Regions

The Eastern Himalaya, though a somewhat homogeneous unit on the whole, is diverse within itself. Significant changes in the physical features, climate, natural vegetation and population patterns are seen in the whole region. Besides, the region includes four different political units. Taking all these factors into account the region has been divided into two first order, six second order and nine third order regions (Fig. 11.4). The international border of Bhutan with NEFA separates the two first order regions.



Fig. 11.4

Darjeeling-Sikkim-Bhutan Himalay?

The region has been divided into two second order regions : (a) Darjeeling-Sikkim and (b) Bhutan. The international boundary of India separating Darjeeling from Bhutan has been taken as the delimiting line. Darjeeling-Sikkim Himalaya is further divided into four sub-regions : (i) Singalila Range, (ii) Donkhya Range, (iii) Darjeeling and (iv) Kalimpong, all of which are distinct physical units. The valley of the Tista divides the Kalimpong region into western and eastern sections.

Enclosed by the deeply dissected Singalila range in the west and Donkhya range in the east, Sikkim basin is only 64 km wide. Both the ranges are remarkable physical units and are called the 'seats of powerful gods' by the superstitious Sikkimese.

The Singalila range receives heavy precipitation from the monsoon and is covered with hundreds of feet thick ice. The avalanches are an ever-present source of danger in this part of Sikkim. The outstanding feature of the Donkhya range is the immense luxuriance and variety of vegetation and the forests are still virgin.

Darjeeling is the headquarters of the district (2,900 km², 1961 population, 624,640) and also a hill station and has been the summer capital of West Bengal. It is situated on a long asymmetrical mountain ridge of the Darjeeling-Sikkim Himalaya which runs northward from Tiger hill, with its almost flat top at an average elevation of 2,280 m and bifurcates into Lebong spur and Birch Hill spur before descending into the Ranjit Valley. The magnificent Kangchenjunga (9,389 m) and Mt. Everest (9,676 m) can also be seen from the top of the Tiger hill.

Darjeeling has a moderately cool but rainy summer, a fine autumn and a dry winter with occasional snowfall. *Cheurasta* (the Mall) on the ridge (2,330 m) is the main shopping centre and the most attractive promenade. A little higher up on the east is the observatory hill (called by Buddhists, 'Dor-jiling-gang', or the hill of the thunder-bolt town, 2,973 m in elevation) which commands a good view. Birch Hill with its

natural park is a beauty spot and contains the Institute of Mountaineering. Lloyd Botanical Gardens were laid out in 1865. There are three colleges of higher education and one natural history museum (Fig. 11.5).

The economy of the district is based mainly on tea which is grown as a plantation crop from the tarai plains right up to the altitude of Darjeeling railway station (2,233 m). There are also plantations of cinchona trees and a quinine factory at Mungpo, 16 km southwest of Kalimpong. Cardamom is another cash crop, which is grown at altitudes from 332 to 500 m.

Kalimpong (25,105 persons in 1961) is the sub-regional centre situated on the main trade route between India and Tibet through Sikkim and is 40 km east of Darjeeling town by road. Kurseong (13,410 persons in 1961) is another hill station (1,560 m) of the region. Baghdogra is the terminus of the airline between Calcutta and Darjeeling.

Bhutan has five sub-regions demarcated on the basis of physical as well as cultural factors, (i) Chomolhari-Kulakangri region, (ii) Punakha-Thimbu-region, (iii) Tongsa region, (iv) Phunt-soling region, and (v) Dewangiri region. The northernmost region of Chomolhari (7,314 m) and Kulakangri (7,290 m) peaks being the land of glaciers has been taken as one region but the Himadri and foothills are divided into four regions longitudinally separated by the Black Mountain range. Punakha-Thimbu and Phunt-soling lie in the east of the range and are more advanced culturally, whereas Tongsa and Dewangiri, lying in the west are comparatively thinly populated and backward.

Assam Himalaya

NEFA or the Assam Himalaya has been divided into four second order regions which are the frontier districts as well as the abodes of specific tribes after which the sub-regions are named, (i) Dafia region, (ii) Miri region, (iii) Abor region and (iv) Mishmi region.

The whole tribal region has a compelling likeness in major respects such as agricultural techniques, housing, attitude and practice of human

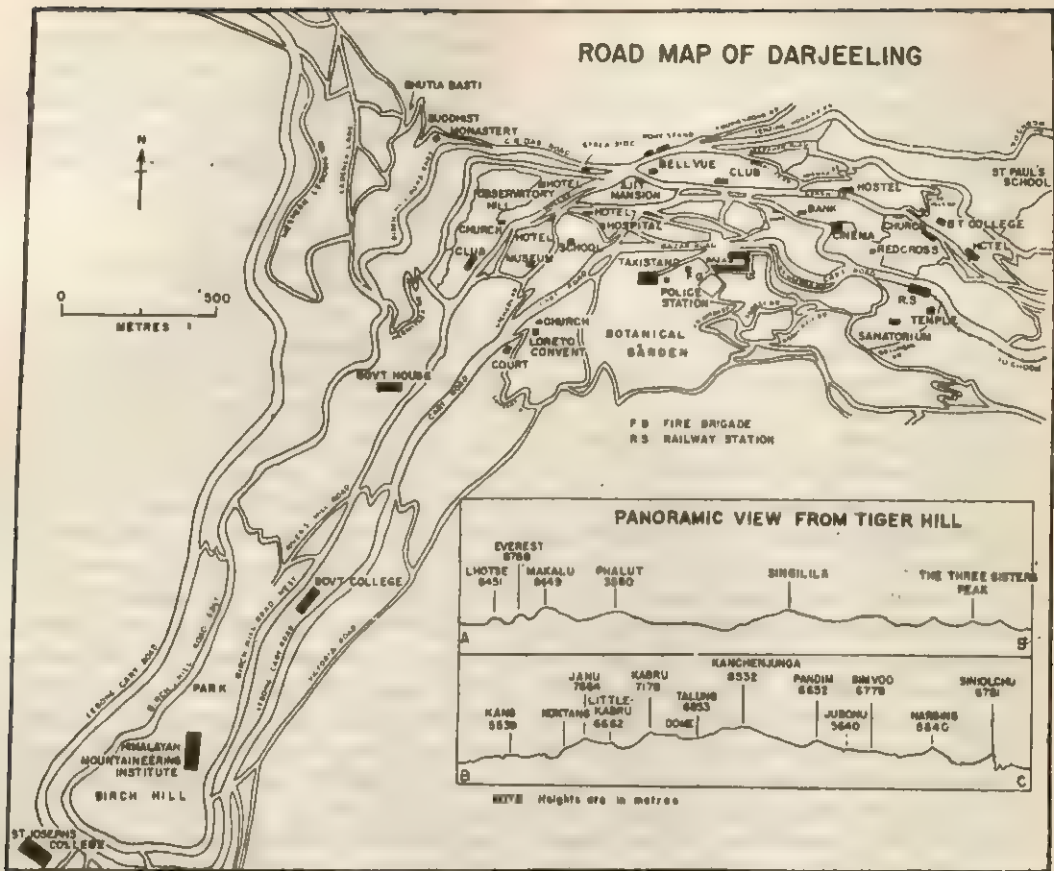


Fig. 11.5

cure, a tendency to remain isolated and seek security in tribal compositions, while they also present an extra-ordinary divergence of culture, language, dress and customs. Therefore, the second order regions have been divided on the basis of the predominant tribes occupying the longitudinal river valleys in the frontier districts of Kameng, Subansiri, Siang and Lohit.

The Daflas (est. pop. 25,245) constitute more than 44% of the total tribal population of the Kameng Frontier district. Also called Bangnis, they belong to the wild eastern part of the district which has only recently been brought under administration, and have long had a reputation for turbulence. In the western part of the district, the Monpas (21,985) are gentle and courteous people who cultivate on terraces, maintain large

number of cattle and are greatly influenced by Buddhist ideals.

The Hill Miri (3,000) people accompanied by the groups of Daflas and Tagins, live in the wild and desolate hills of Subansiri district, whereas the north-western part is occupied by more cultured and settled agriculturists, the Apa Tanis (24,524) who have a large administrative centre, hospital, school and crafts centre.

From the earliest times, the people of the Siang Frontier District have been known as Abor (a rather derogatory word meaning 'unruly' or 'disobedient'). There is an astonishing contrast among the Abor (3,109) people (who now call themselves *Adi*) living near prosperous Pasighat side and those who live in the remote valleys of the north. Little is known of

the small tribes such as the Membas, Ramos and Boris.

The Mishmis in the Lohit region are found in three main groups, the Idus, Taraons and Kamans. They belong to one of the most formidable areas of NEFA and are known for their rude and

aggressive temperament. Recently they have improved their handicraft techniques and Tezu has developed as a prosperous little town. Khampis and Sinphos, the minor tribes, have been in touch with the plains for a long time and are more sophisticated than most of the other tribes of this region.

REGIONAL SCHEME

21. Darjeeling-Sikkim-Bhutan Himalaya

(a) Darjeeling Sikkim Himalaya

(i) Singalila range

(ii) Donkhya range

(iii) Darjeeling region

(iv) Kalimpong region

(b) Bhutan Himalaya

(i) Chomolhari-Cula kangri region

(ii) Punakha-Thimbu region

(iii) Tongsa region

(iv) Phuntsoing region

(v) Dewangiri region

22. Assam Himalaya

(c) Dafia region

(d) Miri region

(e) Abor region

(f) Mishmi region.

Problems and Prospects

Modernization is not easy in the tradition-bound tribal societies. In the region it has been doubly difficult because of its isolation from the outside world, the development of which has long been handicapped by physical barriers that limit its accessibility to people and to ideas. Internal communications, essential to political and economic organization, are still poor and the isolated groups have yet to be welded into one unified State.

The physical resources of the region can be harnessed in the interest of the local population. This can be done by improving the transport and communication links in the region which will enable the people to organise the agricultural and pastoral activities. The region abounds in forests and hydro-power than anything else. The development of industries based on the forest produce and hydro-power will benefit the national and local interests. But the objective of raising

the economy of the tribal people will be served only by concentrating on agriculture, animal husbandry and pond fisheries resources. Education will also help the people in adopting the new techniques and raising their standard of living. P. P. Karan observes, "The inhabitants possess some rare handicraft skills which might be employed in the establishment of manufactures for foreign markets. Silver craftsmen and skilled weavers could be used to make luxury goods for other parts of the world. The economic problems are not simple and when added to the lack of technological skills and raw materials, illiteracy, disease, absence of national consciousness and paucity of effective government controls in both political and economic spheres, their solution becomes enormously difficult".¹⁸ Thus the success of any development programme will completely depend on the efficiency and the grit displayed by the government.

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The Purvanchal ($21^{\circ}57' - 28^{\circ}23'N$ and $91^{\circ}13' - 97^{\circ}25'E$), covering an area of about 94,800 km² with a population of over 4 million (43 persons per km²) incorporates Nagaland, Union Territories of Manipur and Tripura, Mizo Hills and Cachar districts along with a fifth of Haflong tahsil (North Cachar district) of Assam State and a part of NEFA (the district of Tirap and part of Lohit). Its maximum length from north to south is about 755 km and the maximum width from east to west is about 615 km (Fig. 12.1 Inset).

As the name itself suggests, it is the eastern frontier region of India being surrounded by East Pakistan in the south-west, Burma in the south-east and China in the north-east. Its north-western limit, for a major part, follows the boundaries of the Meghalaya-Mikir region, Assam valley and Eastern Himalaya. For a considerable stretch the western boundary roughly coincides with the 150 m contour. Its ranges are a continuum of the eastern Himalaya, and the plain areas of Tripura and Cachar are continuation of Surma valley.

Historical Background

Though the recorded history of Purvanchal is conspicuous by its late beginning, origin of the tribal culture in the region is traced back from the pre-historic days. In the districts of Cachar and North Cachar a number of caves along with rudimentary paintings and carvings have been discovered which offer a good support to the stories of origin of most of the tribes. Speaking of the caves in North Cachar, Mills records a tradition that the remnants of a pre-historic Negrito race were blocked into a cave near Haflong by a Kachari King.¹ The number of neoliths and megaliths collected from Cachar,

Manipur, Nagaland and NEFA is several times larger than that of the caves. From the study of neoliths, Choudhury derives a conclusion that "to whatever people the stone celts belonged, whether the Mon-Khmers of the Austric stock or others, they show definite links not only with Burma, Malaya and the Oceanic world but also with Central and Southern India and with the Gangetic valley and the west. The wide distribution of the celts points only to the once widespread neolithic culture in the land"². Similarly, an inference regarding the origin and migration of the megalithic culture is also drawn indicating that while most of the tribes migrated from south-east Asia and the Oceanic world bringing with them the cult of megaliths and the use of metal at a later time, it seems probable that other waves extended in the tract from India itself.³ The study of archaeological remains in Purvanchal is still in progress and very recently Stone Age sites have been unearthed at Chamba, Teebum, Kale and Glow, all lying on high terraces of the Dapha Bum range between 914 m and 1,220 m levels in Lohit district.⁴ Some of the tools excavated at these sites bear a good resemblance with those found in Kangra valley of Himachal. It again indicates that the fusion of racial elements in the region took place at an early date, while inter-tribal movements were not infrequent.

The Mongoloid tribes certainly came in contact with the Aryans when the latter reached the area via the Surma and Brahmaputra valleys in search of fresh lands for colonisation. Bhagadatta, ruler of the Pragjyotisha kingdom which extended at least up to the western part of the Purvanchal, is mentioned in *Mahabharata* as a powerful ally of Duryodhana with a great army of Cholas and Kiratas. The same epic also re-

the Vedic period. The ancient Sanskrit literature describes them as hill-men wearing war-like skins and carrying formidable weapons. It further accounts that they had ample mineral wealth and forest products in the mountains of their country and were adept in the art of weaving.

Till the British occupation of the region in the last quarter of the 19th century, the threads of its political history are shrouded in myth and mystery. The territory covered under the present State of Nagaland came first into light when the Ahoms, a Shan tribe, crossed in 1228 from Burma to reach the districts of Lakhimpur and Sibsagar in Assam where they organised into a formidable power.⁵ After some time Sukapha (A. D. 1228 to 1268), the founder of the Ahom Kingdom, raided the Naga villages and crushed their resistance with fearful atrocities. Afterwards the Nagas were on friendly terms with the Ahoms who regarded them as their subjects and realised elephant tusks, hand-woven cloth, cotton and spears as a tax and in return allowed them to have their claim over the land. Later on, due to frequent Naga raids hostilities were renewed by the Ahom kings in 1535-36 and 1562 to force them to reaffirm their allegiance to them. Though the relations of Nagas with the Ahoms were not cordial yet they were introduced to their first glimpse of a wider civilization. In a war (A. D. 1490) with the Kacharis the Ahoms were defeated. The set-back was only temporary and the Ahom attacks on the Kacharis were repeated till the latter were shorn of all their territories. During this period of Ahom supremacy the Kacharis in Cachar plains had also to face invasions from the Ahoms and Jaintias of Khasi and Jaintia hills separately. The Kacharis, however, were able to withstand without much loss.

The gradual decline of the Ahom power in the later half of the 18th century led to a relaxation of their pressure on the Kachari kings but soon they found a fresh enemy on their eastern frontier. When invaded by the Burmese in 1824 the Kacharis sought help from the British and the Burmese were driven out, and Assam was ceded to the East India Company by the treaty of Yandaboo (1826)⁶. Now there followed the game of British

annexation of territories on one pretext or the other. The Cachar plains were annexed as early as 1830. The occupation of the Naga Hills was a gradual process to avoid the Naga raids on British subjects. It commenced with the formation of a frontier district in 1866 and lasted till 1904 when the Eastern Angami Country was formally annexed. The history of British relations with the Lushais was one of the constant raids by the latter. To check the same a number of military outposts were established in their midst in 1890. Attacks on two of these outposts caused a permanent annexation of the Lushai Hills (now Mizo Hills) which were put in charge of a superintendent with headquarters at Aijal. The Treaty of Yandaboo had already given the English a right of interference in the affairs of Manipur. To suppress an uprising against its Maharaja in 1890 they occupied the state and vested a large measure of control in the Resident British Officer. After Independence in 1947, the princely states of Manipur and Tripura were integrated with the rest of the country on October 15, 1949, as part 'C' states. With the reorganisation of States in 1956, they became Union Territories under direct control of the Union Ministry of Home Affairs. The North East Frontier Agency was formed on 4th January, 1954, out of the former Balipara Frontier Tract, Abor Hills, Mishmi Hills and Tirap Frontier Tract of the Assam State. It was divided into five frontier divisions (now districts) of which only the Tirap and a part of Lohit are included in the Purvanchal Region. Lastly, Nagaland was constituted as the 16th state of Indian Union in December, 1964.

The process of disintegration of this Eastern Frontier Region into a number of political units at state or regional level may be justified only on the grounds of cultural distinctiveness but from the national point of view and looking into the question of regional viability some sort of political integration at the level of the region as a whole (Purvanchal) is a must.

The Physical Setting

Geological Background

Detailed geological explorations are still awaited in the Purvanchal and as such, the know-

ledge of its geology is so far very sketchy. However, the region is a component of the Assam-Burma Geological Province which itself was a part of the Tethys Sea in the Archaean period. During the Palaeozoic and much of Mesozoic eras the sea continued to receive sedimentary deposits in the form of conglomerates, shales, sand-stones and limestones eroded from the Archaean rocks. The successive periods saw repeated orogenic activities accompanied with extensive igneous intrusions. A final orogenic phase in the early Pleistocene age raised the upland to its present status. At places, folding has been so intense that the rock beds stand up vertically resulting in absolutely bare hill sides. The region is still very much unstable and falls into an important seismic zone of the world. As a result, it is criss-crossed by several faults and strikes, the most important being the Naga thrust, (Fig. 12.2) Haflong-Disang thrust and Dawki-Tear thrust.



Fig. 12.2 : Geology of Nagaland

Relief

The very fact that the Purvanchal chiefly comprises of Purvachal (Eastern mountains) gives a sufficient indication regarding its topographic characteristics. The ranges of the Assam Himalaya running E-W take a hair-pin bend where they cross the Lohit and thence extend southwards

across the Region beyond which they are known as the Arakan Yoma. The region is tight-packed with N-S aligned ranges defined by narrow and parallel valleys. The system as a whole makes a mild bulging towards the west.

Except Tripura and Cachar plains the altitude does not fall below 150 m (Fig. 12.1). In the Mizo Hills the major portion of the area is confined between 150 m and 900 m though peaks of over 1,500 m elevation are not rare. A narrow belt of the same level also runs along the upper portion of the north-western boundary of the region denoting a transition between the Assam Valley in the west and the hills and mountains in the east. The belt, however, becomes considerably wide when joined by the Noa Dihing and Kamlang valleys in the NEFA area. Another but most important region belonging to this class is the Imphal valley where 900 m contour is taken as the outer limit. It is roughly oval in shape running about 57 km from north to south and at least 32 Km E-W. It may be compared with an oblong shallow saucer, the lowest part of which is formed by the Loktak lake. The general elevation of the Purvanchal increases towards north-east and altitudinal range of 900 m to 2,100 m covers a large part of the Manipur hills and Nagaland. Beyond this, the height again decreases to less than 900 m in the western part of Tirap and Lohit districts. But the eastern portions of the same NEFA districts are marked with such a steep rise in the altitude that 900-2,100 m zone occurs in very narrow strip. Lands lying above 2,100 m are encountered only in small patches and that too chiefly in the upper half of the region.

Starting from north, Dapha Bum is the highest range of not only the Lohit district but of the Region as a whole, with a maximum altitude of 4,579 m, and is highly dissected by rivulets and streams. In the Nagaland, the Barail range, piercing from south-west via North Cachar, runs up to Kohima with its highest peak, Japavo (2,970 m) lying to the south of the town. Due to sudden rise of the Barail on its northern face some 12 km wide miniature type *Dun* is formed in between the Barail range and Samaguting hills.

Further east are the Kohima hills and the Naga range. The latter marks the eastern frontier of Nagaland and functions as the water-shed between the rivers of India and Burma but is cut across by the Tixu river draining eastward into the Chin-dwin. This range has several peaks of more than 3,000 m with Saramati (3,926 m) the highest. The hills of Manipur are found to make an oval rim enclosing the Imphal valley. The region ends in the south with Lushai hills which exhibit a typical alternate arrangement of parallel ridges and valleys.

The Tripura-Cachar region represents a low lying plain pierced by a series of long-drawn sharp spurs projecting from the Lushai or Mizo hills. The area is virtually a part of the Surma valley, built up by the detrital materials. Due to lack of sufficient slope the surface is dotted with a number of lakes and marshy tracts.

Drainage

In consonance with the trend of ranges and spurs, the courses of streams are also generally aligned in a north-south direction. The most typical and undisturbed pattern of parallel drainage may be noted in the Mizo hills. The rivers have cut the hill ranges at suitable points almost at right angles resulting into barbed patterns. The Barak, the Diyung, the Dikhu, the Tixu, the Nantaleik and many others are examples in point. In the Cachar district where the tributaries of the Surma descend to the plains a few examples of braided channels are noted.

The rivers of the Purvanchal have sought their outlets almost in all the directions except north. Draining towards west are the systems of Lohit, Burhi Dihing, Diyung, Kusiara and Gumti. The first three form the tributaries of the Brahmaputra while the latter two join the Meghna. The

Kaladan and the Manipur rivers constitute the most important drainage systems of the Mizo hills and Manipur respectively. The Tixu, the Nantaleik and the Naurya collect their headwaters from the eastern frontiers of Nagaland and Manipur. The river valleys in general are narrow.

Climate

The region enjoys a typical monsoonal climate with variants ranging from tropical to temperate conditions. The rapid changes in topography result in climatic changes within short distances. The foot-hill plains, sheltered valleys and the ranges are marked with climatic contrasts. As such, any generalisation regarding the climate of the whole region will hardly be apt for its micro zones.

The climate of the Purvanchal exhibits a strong seasonal rhythm, the year being divisible into four characteristic seasons : (1) Winter (December to February), (2) Pre-monsoon (March and April), (3) Monsoon (May to September) and (4) Retreating Monsoon (October and Nov.).

The beginning of winter is marked by a steep fall (almost 5°C) in temperature during the first month, i.e., December. January is the coldest month. In February the temperature starts rising gradually. The winter winds are generally weak and variable. Occurrence of dense fog during morning hours becomes a characteristic feature of the river valleys including that of the Imphal. Another interesting aspect of the hills and valleys is the air drainage which keeps the valley bottoms cold at night, the temperature at the hill slopes being higher than both at the crests and on the valley bottoms. The snow line exhibits a northward descending trend affected by the increase in latitude. Rainfall is occasional and December is the driest month of the year.

Table 1

Distribution of the Average Monthly Temperature (°C) and Rainfall (in cm)

Station		J	F	M	A	M	J	J	A	S	O	N	D	Annual
Silchar	T.	15.7	18.2	22.0	24.8	26.3	27.3	27.7	27.4	27.3	25.8	21.7	16.8	23.4
	R.	2.0	4.8	17.2	38.5	41.7	58.9	52.1	51.5	38.9	18.4	4.5	1.1	329.6
Imphal	T.	12.4	14.7	18.8	22.1	24.0	25.0	25.1	25.1	24.8	22.5	17.6	13.5	20.4
	R.	1.8	2.8	3.2	11.3	26.8	28.3	27.1	15.8	13.1	9.8	3.0	0.4	143.4

The commencement of the pre-monsoon period is felt in the very first week of March through a sudden increase in temperature which continues unless the season is over towards the end of April (Table 1). Due to the interaction of northwesterly, southerly and northeasterly air masses, instability develops and severe thunderstorms occur extensively, sometimes preceded by dust-raising squalls. With the advance of the season, the amount and frequency of rain increase and the rainfall is generally associated with afternoon or evening thunderstorms and squalls. Hailstorms may also occur in the season.

The monsoon period lasting for about five months from May to September is the largest season of the Purvanchal. The tendency of rise in temperature which remains a characteristic of the pre-monsoon period is brought to almost a stand still by the long spells of rain. June is the wettest month followed by July and May. The rainfall is mostly associated with storms. Rainfall is generally heavy in the whole region and communication between different areas becomes difficult.

Towards the end of September the south-western winds become feeble and the following two months experience their retreat. The rains gradually stop, temperature moves downwards and the sky becomes clear. The season is a most pleasant part of the year.

The amount of total annual rainfall in the region varies from a minimum of 100 cm to a maximum of over 300 cm. The north-western part of the Mizo Hills along with the adjoining areas of Cachar and Manipur receives the heaviest fall. Manipur receives less than 150 cm. The Tripura, the rest of Mizo Hills and Cachar, North Cachar and the western half of Manipur hills receive between 150 to 200 cm. Towards northeast there is a further decrease in the annual amount, but as already noted, the local variations depending upon topographical features are much pronounced. The hill slopes facing the south-western monsoon always receive larger amounts than the enclosed valleys. The case is, however, quite different with the valleys of Lohit, Burhi Dihing and Surma that open in the plains

and that, too, facing southwest. The amount of rainfall received by them is much higher.

Natural Vegetation

The Purvanchal may still be considered as a treasure land of natural vegetation though its forests have suffered a lot due to century-old *Jhuming* practices. The variations in altitude, latitude, climate and soil have given rise to a diversity of forest types ranging from tropical evergreen to temperate evergreen and the coniferous.

Among the most common species seen on lower elevations mention may be made of the *Naya Bhe* which, though seen in the plains, is more common on the hills where it grows to a larger size. *Photaki* and *Photkola* (different species of *Molastoma*) grow in deep ravines and assume the form of small trees (3 to 4 m high). Bamboo jungle is extensive everywhere, but it exhibits a better growth in low-lying tracts and ravines. Apart from these, *Mesua ferrea*, *Careya arborea*, *Ficus electica*, etc., are some other plants that are commonly found under the tropical evergreen group. The important trees comprising the temperate evergreen type forests, which are generally a feature of hill slopes lying above 1,800 m, are oak, chestnut, birch, magnolia, cherry, maple, laurel, fig and moly. The forest above 2,100 m is cool temperate and contains species such as pyrus, sorbus, acer and *Magnolia campbellii*. Wang is an important structural timber which can be used fresh as it never warps.

In the protected forests the government declares a few species as "protected trees", otherwise, the tribals have their usual rights. From unclassified forests the tribals are allowed to collect forest produce for sale but only after due permission from the Civil authorities. It is in these forests that *jhuming* is widespread.

Soils

The soil cover is generally thin except in the river valleys or along the foothills where comparatively thick layers are found. On the gentle hill slopes the soils have developed *in situ* while those lying lower down are transported by rain-wash. On the flood plains in the valleys mostly clayey soils have been deposited.

The soil types and their composition differ from region to region. In Titap and Lohit districts of NEFA the soils found on foot-hills are diluvial in nature being either loams or sandy loams mixed with pebbles brought down by rain from higher slopes. Soils in the valleys are clayey alluvium and rich in organic content with higher moisture-retaining capacity.

The soils of Nagaland are of two types : (i) ferruginous red soils, and (ii) laterites. The former occupy the major part of Nagaland and are poor in lime, potash, iron oxide and phosphorous content. The clay in the red soils has developed kaolinitic structure. The main characteristics of this soil group are light texture and porous and friable structure. The next type, i.e., the laterites, occupy a very little part of the region along the border of Sibsagar district of Assam. The soil is compact to vesicular mass in sub-soil and is composed essentially of a mixture of the hydrated aluminium and iron oxides. Chemically, the soil is deficient in potash, phosphoric acid, lime and oxides of alkali and alkaline earth metals.

The central plain of Manipur being the flood plain of rivers that drain it has thick deposits of sands, clays and silts of fluvio-lacustrine origin with their usual characteristics. The soils in the Manipur hills, Mizo hills and North Cachar hills are almost similar to each other being usually associated with a reddish loam. The foot-hills are covered with gravels and sands.

The flat land in the plains of Tripura and Cachar is all through alluvial consisting of sand, silt and clay in different proportions. But the forest soils on *tillas* are generally loamy sand.

Due to prevalence of steep slopes and high rainfall in the region soil erosion is an alarming problem for the cultivators which is further aggravated by *Jhuming*.

Minerals

Though the possibilities of occurrence of some valuable minerals, including petroleum, cannot be ruled out in the Purvanchal, only a few of them are exploited at present in small quantities. According to existing data the mineral resources of economic value are available only in Nagaland, Mani-

pur, Tripura and North Cachar. In Nagaland a certain amount of tufa lime has been discovered in the Sijju valley to the east of Kohima while lignite is found in the hills near Nichugath. Some coal is also discovered near Aakey village and in the hills through which the river Disai debouches into the plains but the deposits are too inferior to be worked upon. Among the minerals available in Manipur mention may be made of iron ore, copper ore, rock salt and limestone. The occurrence of iron ore is limited only to a few localities in the Imphal valley while copper is exploited near Ukhrul. Rock salt and limestone are tolerably abundant at many sites. The deposits of limestone are also noted in the hills of North Cachar. In Tripura, clay is found near Agartala and is locally used. Deposits of lignite, limestone and ochre have also been reported but the quality of reserves is commercially unimportant. There is a good prospect for petroleum being found in Tripura as much of the territory is occupied by the same tertiary rocks which yield oil in Assam and Burma.

The Physical Resource Base

As obvious from the foregoing, the physical resource base of the Purvanchal lies in its soils, forests, water and minerals. The soil is quite suitable for cultivation of various crops and fruits like oranges, grapes and mangoes. The wide stretches of alluvial soil in the Imphal and the Surma valleys are quite fertile. It is on these alluvial deposits that most of the non-tribal population of the region thrives. A considerable tract of gentle slopes and good soil-cover has also been developed in the NEFA region.

The forests of Purvanchal are valuable for a variety of produce like timber, bee-wax, rubber, *kbair*, gum, etc.

The water resources of the region (a land of rivers) go in waste except for limited use in irrigation and water mills. The region has good potential for hydel power generation. The rivers and lakes are a good source of fish which may be augmented on scientific lines. There is possibility of petroleum being found in the area and of some other minerals as noted above.

The Cultural Setting

In spite of an overall unity, areal differences in the physical setting of the region are so sharp that they have told heavily upon the homogeneity of its cultural landscape. Even the small areas give their own typical look with respect to human activities. Under such circumstances it would be of no use, rather confusing, to present a general account of the cultural aspects of the region as a whole. Therefore, it is preferred to discuss the cultural phenomena like population, settlements, agriculture and industries by sub-regions, namely, the Tirap-Lohit region, Nagaland, Manipur, Mizo Hills and Tripura-Cachar region, which happen to be, as will be seen in the sequel, second order regions of the Purvanchal in its general regionalisation scheme.

The Tirap-Lohit region

Population and Settlement

Owing to its extremely inaccessible nature and a very sparse population, the Tirap-Lohit region has till recently been unknown as is the case with the whole of NEFA. It was only in 1961 that the first census of the area was taken and that, too, on a simplified schedule which lacked information pertaining to many a vital demographic aspects like the occupational and employment figures. However, the region has 67,300 persons in an area of over 16,000 km², with an uneven spatial distribution. The density is 8.4 persons per km² in the Tirap district while it is less than one in Lohit. This anomaly is due to different nature of terrain. Not only the general relief over the entire north-western part of Tirap is low but the district is also highly dissected by a number of wide river valleys like those of the Tirap and the Noa Dihing. It is in these river valleys, particularly along the Brahmaputra plains, that the major part of the population is concentrated. In Lohit majority of the population is confined to the western part, chiefly in the southern portion of the Lohit valley. The eastern parts of both the districts are very sparsely populated but the trend is by far more pertinent in the case of the latter which embraces a number of high

mountain ranges representing large tracts of uninhabitable land.

About 93% of the population is tribal in Tirap and 81.6% in Lohit. Among the tribes of Tirap, Noctes (19,353), Wanchos (23,393) and Tangsas (11,274) are noteworthy. The Noctes and Wanchos still stick to the "Chiefship" system under which tributes are paid by the villages to the chiefs. The Noctes are concentrated very close to the plains and profess a sort of Vaishnavism imparted to them by Hindu priests some hundred years ago. However, this has not much affected their living and eating habits. The Wanchos have very little contact with the outside world and remain almost naked. The Tangsas are spread in the eastern tracts bordering Burma. They wear *sarong* in the Burmese style. Lohit, earlier known as Mishmi hills, is the home of Mishmi tribes, divided into three main groups—the Diagam, Miju and Idu. Owing to their love for opium and smoking, they have become lethargic and devitalised. In the extreme eastern part of the district live the Khamptis and Singphos, small Buddhist tribes, carrying some Burmese influence. The Khamptis have been in constant touch with the plains and ate more sophisticated than most other tribes.⁷

The entire population of the region is rural. As to the sex ratio, trends are different in tribal and non-tribal populations. In the case of tribals the ratio is in favour of males at birth but goes otherwise in the age group of 15 years and above. The case is reverse and quite strange among the non-tribal population where the number of females per 1,000 males is only about 260. It very strongly reflects a character of migrant population. The proportion of population below 15 years of age is about 37%. This may be correlated with the scarcity of medical facilities in the hilly areas resulting into high infant mortality. Literacy is only 7.2% and it is higher (12.3) among males but only 2.1 among the females. However, it can be presumed well that almost all persons of the age of 14 years and above are gainfully employed, mostly in agriculture.

There are about 250 villages varying in size from less than 200 persons to over 2,000; the

small size villages predominate (over 95% with less than 500 persons). A few tribes like the Mishmis in the Lohit are very much individualistic and attach little importance to community life. Tribe constitutes the most important bond rather than the village unit. Their houses are scattered, the social unit being the house itself. But the houses are comparatively larger, sometimes reaching up to 50 m in length and sheltering up to 60 persons.

Agricultural Economy

Agriculture is the main occupation of the people and *Jhuming* is the usual practice. The techniques of conventional agriculture, e.g., ploughing and manuring find no place there. Hoe is the backbone of all farming operations. However, there are a few tribes like the Khamptis of Lohit who have learnt the use of plough dragged by buffaloes. They are also skilful enough to utilise the flowing water to turn their rice-husking machines. About 800 ha of land were brought under the new practice in the First Plan period. Efforts are made to induce the tribes to take to permanent cultivation.

The two districts exhibit a considerable difference with respect to their cropping patterns. In Tirap the variety of crops is limited, paddy, millets and maize being the dominant cereals supplemented by kochu, arum and tapioca. On the other hand, a good diversity is noted in Lohit district. Wheat, barley and buckwheat predominate in the upper reaches while rice, millets, *mati kealai*, sugarcane, potatoes, oilseeds, etc. are chiefly grown in the lower parts. Horticulture is also being developed and a few pineapple plantations may be observed.

Industrial Economy

Every family, as it is self-sufficient unit, weaves cloth and prepares baskets, wooden utensils, bows and arrows, traps, sleeping benches and several other articles of its daily need. Money is also not in circulation. Thus, very little scope for the growth of industries is there at present. Whatever industrial activity there exists is only in household form. Rudimentary blacksmithy

and silversmithy, cane works and bamboo works may be cited as the principal examples in point.

Nagaland

Population

The derivation of the word 'NAGA' used for the people of this land is obscure. It has been generally believed that the term Naga is derived from the Bengali 'Nangta' or Hindi 'Nanga' meaning naked while some others think that the Kachari "Naga" meaning a youngman and hence a warrior is the source for this word. It is also suggested that the derivation is from the word 'Naga' meaning a snake. Verrier Elwin thinks that the word is derived from 'Nok' meaning 'people' in a few Tibeto-Burman languages. Whatever be the origin, the term is quite foreign to the people themselves. They have no general term for the whole race but use specific names for each particular group of villages. Till recently the term 'naga' was not in general use among these tribes, but as they became more united and politically conscious they began to use this name for themselves and today it has become widely popular. The region with a score of tribes that comprise 93 per cent of the total population have nothing in common with one another as regards customs, festivals, habits, languages and dialects. Majority of the tribes have adopted Christianity and use different languages but all use Roman script which facilitates the growth of literacy. The Assamese is the means of communication between different tribes.

The 1961 census of 369,200 persons has a rough tribewise composition as follows—(1) Konyaka—63,000, (2) Aos—50,000, (3) Semas—48,000, (4) Chakbesangs—31,000, (5) Angamis—30,000, (6) Lhotas—23,500, (7) Sangtamas—20,700, (8) Yimchungas—17,500, (9) Changs—17,000, (10) Khien-mungans—17,000, (11) Phoms—13,000, (12) Zeliangs 5,250, (13) Renemas—5,000, (14) Mixed tribes—5,000.

The major part of this population lives in 814 villages (1961) to give a rural look to the region, yet the distribution is not even in the three districts of Kohima, Mokokchung, and Tuensang; the former two carry a density of 25 persons per

km² while Kohima has only 18 which is below the State average (22). This disparity is more due to nonavailability of habitable land than to cultural or social factors.

Growth of Population : Nagaland minus Tuensang district, known as the district of Naga Hills, was first censused in 1881 when its population was 86,637; this rose to 101,550 by the next decennial census. During last 60 years population has increased by 2.25 times with a steady rate though not uniform from decade to decade.

The abnormal growth of population in the decade 1901-1911 (46.8%) cannot be accounted for as due to immigration to this inhospitable land or to the natural increase when there were only 85 children under five years for every 100 married women between the age group of 15 to 40 years. The increase is explained as due to addition of territory, immigration of missionaries, civil and army staff and partly to the natural increase. Unaffected by the virulent epidemics of 1911-21 that took a heavy toll of life in India, Nagaland showed an increase of 6.55 per cent.

The augmentation noticed in population during 1901-61 was not uniform in the region. In 1941-51 when Kohima district showed a decrease of 0.7 per cent, Mokokchung showed an increase of 18.3 per cent but this anomaly was due to transfer of all the Lhota villages and most of the Sema villages from Kohima to Mokokchung district in 1947. Due to inclusion of Tuensang in 1957 an abnormal growth of 73.35 per cent in population is seen in 1961 census, but actual growth was only 14.7 per cent which is quite moderate when compared with the all India figure of 21.5 per cent.

Sex and Other Structural Elements of Population : While the sex ratio for Nagaland as a whole is 933, for the districts of Kohima, Mokokchung and Tuensang it comes to 888, 958 and 945 respectively. While in urban population the sex ratio is only 628, in case of rural population it is 953. The sex ratio also varies from community to community. Among the Nagas the sex ratio is higher. As regards individual tribes the Aos and Lhotas have females in excess of the males while reverse is the case with the Angamis and

Kachas. The difference in sex population is evident in the occupational structure too. Of the total workers of the State 115,554 are males and 103,756 females; the females are more in agricultural occupation while males in non-agricultural occupations.

Rural Settlements

Being engaged in activities directly connected with agriculture Nagaland has its 95 per cent population in villages. There are some 814 inhabited villages in Nagaland of which 299 are of population below 200 persons and 282 of below 500 persons. These villages together cover two-thirds of the total number of villages. There are only 12 villages whose population exceeds 2,000 persons.

The Naga villages are formed with little regularity on the summits and crests of different hills but generally choosing high tabular hills or saddle-back spurs running off from the main ranges. Most of the Naga settlements are in between the height of 1,200 m to 2,100 m as below and above these heights climate does not suit to health and crops. Generally the villages climb step-like up the mountain slopes and scarcely these houses stand on the same level. The houses though irregularly arranged are generally built in two lines, the gable ends of houses of each row projecting towards the main street into which the garbage and refuse are thrown making the village dirty. Some 20 to 100 houses on hill tops or slopes constitute a Naga village.

Village Morphology : Several rites are performed and sacrifices made before selecting a site which generally is on the hill top. The Aos and Lhotas arrange their houses along the streets on top of the ridges while the Angamis prefer the tabular hill tops. However, a Naga village has a defined boundary having gates on its two sides. Inside these gates whosoever lives gets protection from the village community at the time of need. The villages are mostly well-fortified and at the time of war to make the hill sides and their approaches impregnable *Panjies*, the wooden nails are closely pegged on them. The approaches to the villages are often through tortuous narrow covered

ways or lanes with high banks on either side, thus making a passage of only one man at a time.

All the villages are divided into *Khels* or quarters with a separate administration. Prominent in many villages is the *morung*, a dormitory for young bachelors. Some tribes have small houses for the young maidens too. The *morungs* serve as guard houses, recreational clubs and centres of education, art and discipline. The villages as well as the farm-yards are connected with one another by roads and paths which are constructed with considerable skill to make the precipitous hills of easy gradient.

Urban Structure : Nagaland with the exception of Himanchal Pradesh and Sikkim is the most rural State in India (only 5.2% is urban). There are three urban centres—Kohima (7,248), Mokokchung (6,153) and Dimapur (5,753). Kohima recorded in 1901 a meagre population (3,093) which was more than doubled (7,246) by 1961. By becoming capital of new state of Nagaland it has received a great fillip and so also other towns. Tuensang, the new headquarters of Tuensang district has started an urban career recently.

Kohima town having status of a regional capital since 1891 covers an area of 10 km². This administrative hub has a bazar in the centre, where besides local inhabitants villagers also come to sell their goods. The town is quite well-planned with concentration of the residences of officers over separate hill tops according to their status. There are also good number of military camps and quarters occupying considerable area of the town. Kohima is also an important nodal point (Fig. 12.3) and N. H. 39 connecting Dimapur to Imphal passes through it. The nearest air port is Rowra (Jorhat) 203 km and the nearest railway station is Dimapur, 74 km from Kohima.

House Types: The architecture of the Naga houses is determined rarely by the physical factors. The houses with single storey are built on the slopes or hill tops after being dug down to a rough level. The houses are generally arranged in irregular lines facing inward. In width the houses vary from 6 to 12 m and in length from about 10 to 20 m and are divided into two or three

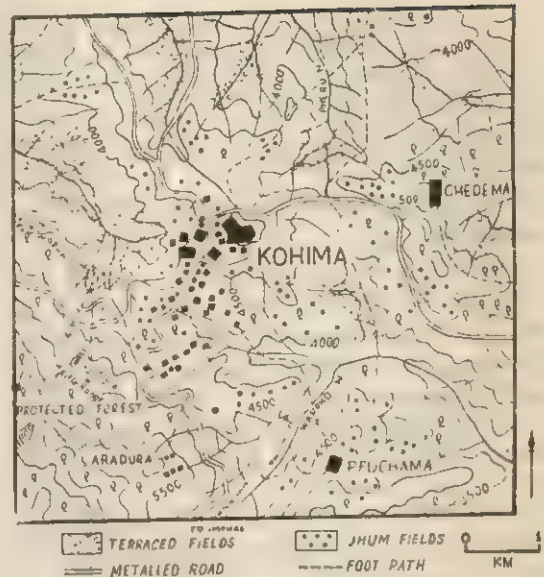


Fig. 12.3: Showing Kohima & Environs

compartments according to the taste and wealth of the owner. Of the apartments the largest is for common use while the others are appropriated to the females. The houses have high gable ends with eaves almost touching the ground as a precaution against the high winds. The front gable which in case of man of wealth or position is often decorated with broad handsome feather boards, is 5 to 10 m in height. The gable at the back is only about 3 to 5 m in height. On these gables, roofs slope off in rear as well as towards the sides. Though the use of grass as a thatching material is prevalent among the Angamis, yet in general, the roofs have a thick thatch of Tokopat, Levis-tonia, Assamica, etc., the different kinds often fancifully intermingled and bound on with a neat ridge of grass at the top to get a protection against both torrential rain and the scorching heat of the sun. The bamboos provide an excellent and versatile building material here. The thick strong stems serve as posts, the splitted and plaited ones as the wall material and floor coverings while the narrow cane strips form ligatures that take the place of nails and clamping irons to bind the posts together. In front of each house large stones are placed on which Nagas enjoy their

gossips and sip rice liquor. Naga house without a window is dark inside even during the day time. On one side of the entrance is a cylindrical basket of a dimension 1.0 m by 1.5 m and in a corner lamp is kept. Wooden planks are arranged round the fire for sitting purposes. Due to free access of pigs and fowls inside, the dwelling is filthy inside.

Agriculture

Agriculture is the mainstay of the people. Only about 40% of the total area is available for cultivation. The main drawback is the shifting nature of cultivation resulting in soil erosion and reduction of fertility. In Mokokchung and Tuensang districts 80% of the agricultural land is under shifting cultivation whereas it is only 20% in Kohima district.

Of the total area of 105,997 ha under cultivation only 20,277 ha are under permanent cultivation while in about 84,295 ha jhum cultivation is practised. About two hectares of cultivable land per head are available but the area under actual cultivation is only about 0.20. There is an interesting juxtaposition of shifting and sedentary agriculture under such a terrain.

Jhum Cultivation : The average dimension of a jhum field or *Sukhan-Kheti* (dry farming) is about 0.50 to 0.70 ha. Each family owns about 8 to 9 such fields as a field after two to three years of cultivation has to be left as fallow for eight to ten years. The preparation of a jhum field is rather a laborious task. The jungle cutting for the jhum begins in August or September, just before the harvesting of terrace fields. The trees, bushes and shrubs of the selected field are cut down with the *dao*—a large chopping knife, and are stripped of leaves and twigs. These leaves and twigs are left to dry on the field till February when they are collected in small heaps and burnt. The burnt field is carefully turned over with the hoe to get it mixed with ash. The hoed soil is levelled with bamboo rake and then sown with rice in broadcast. After this, weeding operation is done thrice, the first in April by hoe and hand, second in May by small hoe and third in July by hand. Harvesting is done in September when the ears are cut off and collected in bamboo baskets.

In the second year the same or some other variety of paddy is cultivated but in the third year millets are grown on the same field. In addition to these, cotton and vegetables like ginger, chillies, pumpkin, watermelon, gourd, taro, yam, sweet potatoes, lentils, tomato, soyabans, kuchoo, carum, capsicum and potatoes are also grown.

Jhum has several drawbacks. First it depends totally on natural rain, secondly constant weeding is essential, thirdly top soil is removed by the steep-gradient-rivulets for the absence of natural vegetation and fourthly the Jhum cultivator has to work throughout the year in the field. Lastly after two to three years of cultivation the Jhum field gets overgrown with weeds especially of the compositae and labiateae families to make it unsowable and accordingly a fresh jungle is to be cleared.

Terrace Cultivation : The Angami Nagas have adopted terrace cultivation which is known as *panikheti* or wet farming. The method of preparing land for wet cultivation is to dig and build the side of the hill into terraces 1, 2 to 3, 4 m broad and sometimes even 60 m broad if the ground is level enough. The stones which have been removed from the soil are used to bank up the walls of the terraces. The average terrace is 1/2 to 3/4 m high. As the terraces have to follow the contour of the hillside they are never of any considerable length.

Each terrace cannot have its own channel and usually obtains water either from the terrace above it or from one of the terraces in the same row, the terraces being so carefully graduated that the water may flow from terrace to terrace round a whole spur and back again to a point little below from which it started. Water is also carried from one terrace to another in hollow bamboos passing over other terraces and channels in between. The lowest terraces are generally more or less under water. Though no regular manuring like in jhum land is done yet manures in the form of cattle droppings or the refuse of animals and household are frequently applied to the terrace fields. The cattle are generally left over the terrace fields to graze during the winter season. In terrace

fields several kinds of paddy are grown, the most important being *Kemephno* and *Kemeyana*. The former variety is sown about a few weeks earlier than the latter. *Kemeyana* variety is sown in the fields that are away from the villages. This is the best variety for making rice-wine. The method of terrace cultivation is rather traditional. The plough is never used. The main implements used are the *Dao* and the hoe. Most of the work is done by hand.

The ripe plants are tied together in small

bunches and the ears are cut off with a sickle known as *Zupfinio*, a light sharp edged curved iron blade. The stalk of the rice is left standing till the whole crop has been harvested. It is a taboo to cut the stalk before completion of the harvest.

Apart from the agricultural products of Jhum and terrace cultivation discussed above the Bay leaf or *Tejpat* of commerce is abundant everywhere in Nagaland and tea is grown in considerable quantity on the hills by the Angamis.

Area under Major Crops (Hectares) (1961-62—1967-68)

Autumn rice	Winter rice	Maize	Small millets	Gram	Tur	Rabi pulses ²	Beans
86,856	43,620	8,568		3	59	1,320	1,392
Sesamum	Rape and mustard	Cotton	Jute	Sugar cane	Potato	Sweet potato	Shillie
587	1,222	92	478	1,078	3,242	232	1,094

Irrigation plays a vital role in the agricultural activities of the Angamis as well as in converting the jhum fields to sedentary ones. On government initiative irrigated land has nearly doubled during 1961-69 and now covers about one-fourth of the net sown area.

Industries

Though the inhospitable terrain of Nagaland has prevented the inclination of investment in industries yet the hard working artistic Nagas have many traditional cottage industries among which the weaving is notable. The Naga handloom fabrics are in great demand in the plains for their unique design and colour combination. The Planning Commission has approved the establishment of two major industrial projects viz., a sugar mill at Dimapur and a pulp and paper mill at Tuli in Mokokchung district.

In 1967-68 a Jhamsari sugar mill with a daily crushing capacity of 60 tonnes has been started at Dimapur now producing 425 quintals of high grade sugar and 609 quintals of molasses. There is a plan to increase the crushing capacity of the plant to 1,000-1,250 tonnes.

Bhutan and Khangra grasses are available abundantly around Tuli area for paper industry. Se-

riculture which is very suitable for the climatic conditions of Nagaland has been introduced here recently. *Eri*-rearing has also been introduced in 60 villages of Mokokchung and Kohima districts. A full-fledged silk farm at Mokokchung, one Eri Seed Grainage and one demonstration centre at Dhansiripar are established.

Among the forest-based industries seasoning and treating of timber has been started at Dimapur and the treated timbers are being supplied to Defence and Public Works Department for their various constructional works.

Manipur

Population

The union territory of Manipur (area 22,347 km²; 1961 pop. 780,037) has highly uneven distribution of population. The central plain, also known as the Imphal or Manipur valley, occupies only 8% of the total area but supports about 65% of the total population. This unique incidence may be attributed to its almost level plain, fertile soil, developed transport and communication and its distinguished situation amidst a vast hill region where no other such land is available with such historic significance. The surrounding hill tracts, on the other hand, cover more than nine-

tenths of the total area but owing to a combination of several disadvantageous factors, account for about one-third of the total population. At the sub-division level, the per km² density ranges from 261 to 427 persons in the Central Plain and from 8 to 28 persons in the hills. Imphal East and Imphal West sub-divisions which include the population of Imphal town represent the area of highest density.

The population of Manipur chiefly comprises of two ethnic groups⁸—the hill people and the valley people who have nourished traditional cultural cleavage. Those inhabiting the valley are known as the *Meiteis* while the population in the hills is again divided into two sub-groups—(i) the Nagas to the north and (ii) the Kukis to the south. Most of the Nagas have permanent settlements and practise terrace cultivation. The Kukis, on the other hand, lead a semi-nomadic life as they depend upon Jhum cultivation and go on changing the sites of their settlements.

The population has continuously been increasing since 1901, the overall growth during the last six decades being 175%. Even during the decade 1911-21 when the country as a whole recorded a phenomenal decrease Manipur marked a positive variation of 10.9%. The increase has been most remarkable (35.0%) in the decade 1951-61. It primarily represents a natural growth which has been highly augmented by the spread of health and maternity services.

Out of the total population of over 780,000 only 67,717 persons (8.7%) are urban residing in the only town of Imphal. The females outnumber the males, the ratio being 1,015. Manipur has got the highest literacy among all the sub-regions of Purvanchal. The average literacy figure for every 1,000 population is 304; male literacy is higher (451) than the female (159). More than four-fifths of the total population are engaged in agricultural activities.

The rural population (712,320) lives in 1,866 inhabited villages (1961). The villages are mostly of small size (1,066) having less than 200 persons each, and containing only 13.8% of the total rural population. The village size of 1,000 to 1,999 persons may be treated as the most impor-

tant as it accommodates the largest single proportion (24.1%) of the rural population. In the hills the settlements are strategically dotted on flat-topped ridges from where the enemy may be easily sighted and which enjoy healthy climate also, free from the mosquito menace. The layout of the village is bound to follow the ridge on which it stands and thus sometimes may be as irregular as the ridge itself. The Kuki villages are temporary settlements which are changed in keeping with the needs of the shifting cultivation. The houses are small and rectangular in plan. In the central plain where a sort of homogeneity in the physical and cultural landscape prevails, regularly spaced, compact, but small villages become the rule. In front of each house there is a small pond for domestic use.⁹

Imphal Town : Imphal (Pop. 67,717; 1961), the regional as well as political capital of Manipur, lies on the right bank of the river Imphal, amidst a vast alluvial plain. The town which occupies a considerable area at present, has grown through several phases. Prior to the Agitation of 1890-91, the settlements comprised of only the old palace-Kangla, the then palace residences and Fologround all being presently occupied by the Cantonment area. The nucleus was highly defended, being bounded by river Imphal on the east, a dry moat on the north and wet moats on the west and south. The second phase started with the Agitation itself when the entire town was occupied by the British forces. The palace was shifted to its present site in the south-east, the polo-ground and bazar to the west of Dimapur road and the *bastis* surrounding the old town were driven out beyond the Naga-Turel and the Nambul rivers in the west. The newly built town is planned on a rectangular pattern. The town was destroyed in the Second World War after which there commenced the third phase of its growth. The reconstruction of the town also saw its expansion towards south, west, north and very recently towards east beyond the river Imphal.

Imphal being a planned town can easily be divided into three zones : (i) the Municipal, (ii) Cantonment, and (iii) Other areas. • The muni-

central area may further be sub-divided into different functional units, i.e., business zone, administrative areas, educational pockets, recreational and health centers (Fig. 12.4). The business centers known as the Maxwell Bazar, Sadar Bazar, Purana

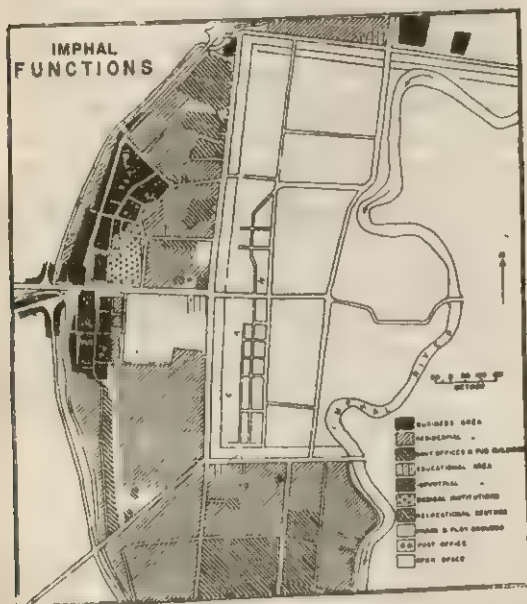


Fig. 12.4

Bazar, New Bazar etc., are located in the form of a continuous zone about the Naga-Turel and Nambul-rivers. The administrative zone has civil hospital, govt. schools, pologround, library, etc. to the east of the business zone. The cantonment forms a small compact block in between the municipality in the west and river Imphal in the east. The municipal and cantonment areas are almost surrounded by residential areas from all sides.

The Economy

Agriculture stands as the chief occupation of the people supporting about 84% of the total population. In the hills the agricultural plots are small and scattered. At places terraced cultivation has developed but the wasteful practice of Jhuming is more prevalent. The fertile central alluvial plain is an area of intensive agricultural operation, the tilling and harrowing being performed with the help of draft animals. Among

the crops grown, paddy occupies the top position, both in the valley and the hills, and covers over 80% of the total cropped area. Among the crops of lesser importance mention may be made of wheat, mustard, pulses, and variety of vegetables, chiefly grown in the central plain.

No doubt, the region offers a good scope for the growth of industries based on forests, agricultural raw materials and minerals, particularly limestone; no large or medium size manufacturing has developed so far. The traditional cottage industries and a few small scale factory industries denote the industrial activity. The handloom industry is well developed and provides employment, usually part-time, to about 200,000 persons. Thus, at least one out of every four persons living in the territory is more or less attached to it. Manipur maintains such an outstanding position in hand loom-weaving that with a very small areal extent, it stands sixth in India with respect to the number of looms. The territory has also acquired reputation in some other handicrafts like embroidery, metalware, cane and bamboo works, traditional costumes, doll-making, rolled gold ornaments, etc.

In 1966, there were 14 registered handicraft cooperative societies in Manipur. Recently some small scale factory units are turning out bricks and tiles, bakery, soap, and others are engaged in automobile servicing, hosiery, fruit preservation, printing, etc.

Mizo Hills

The Mizo Hills district, a sub-region of the Purvanchal, has a population of 266,063 (1961) spread over an area of 21,090 km² with an average density of about 13 persons per km². When considered at a subdivisational level, the density remains about 15 for Aijal and 9.4 for Lungleh. It is obvious that the density decreases from north to south. The most important factor behind this trend is a southward increase in humidity and temperature which results into a general unsuitability of the climate for human habitation. The density also decreases from west to east, the rate being greater than that towards south. The river valleys in the western part of the region

are wider which sufficiently allow the growth of human settlements along them. Towards the east the slopes become steep and the valleys narrow accompanied with humid, hot and sultry weather.¹⁰ As such, the progress of human occupancy is very much retarded.

The Lushais are the most predominant tribe inhabiting the region though a few others like the Pancei, Lakher, Chakma, Riang, etc. are also found in small numbers, especially to the south of Lungleh. As is the case with other areas of the

Purvanchal, the population in the Mizo Hills, too, is mostly rural, the only urban centre being Aijal (1961 pop. 14,257), the district headquarters. The sex ratio is almost balanced.

The patterns of settlement in the region exhibit some contrasting features. In the western part where relief is low, valleys wide and not unhealthy, most of the settlement sites are located in the valleys. But in the eastern part where the stream valleys become inhospitable due to their harsh climate, hill crests and slopes offer the only

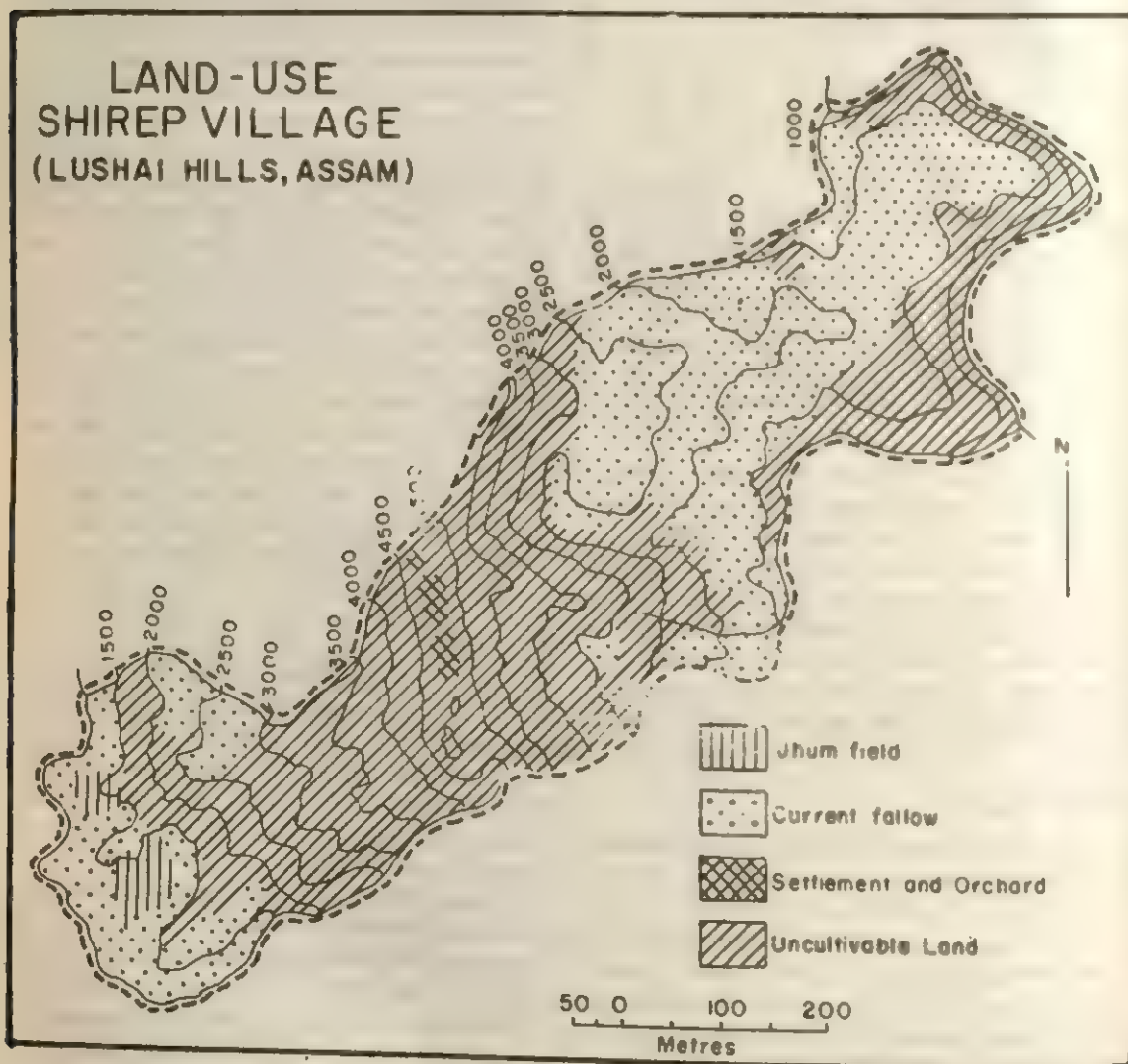


Fig. 12.5

alternative base for human habitation. Further, the valley dwellers try to lay their houses as close to the river bank as possible and as a result, the settlements are mostly linear in pattern. On the other hand, the settlements lying on the hill tops are somewhat compact. In case the settlement is located on a hill slope it may, however, develop an elongated form straggling along the contour.



Fig. 12.6

The chief economic activity of the people is jhumming cultivation. The pattern of shifting cultivation and the use of land in the Mizo Hills can be illustrated by two villages¹¹, i.e. Mampui and Shirep (Figs. 12.5 & 12.6). The former (410 persons, 1961; and 75 families) has about

2,600 fowls, 240 pigs, 100 goats and 50 cows, while Shirep (239 in 1961; 40 families) has about 1,000 fowls, 72 pigs and 70 cows. Thus, Mampui is a rich village, inhabited by the Pawi people, mainly because of more extensive area of comparatively greater gradient than the average for the region and also lower altitude which favour shifting cultivation. Shirep, on the contrary, is an example of a poor village with a mixed population of the Fawi, Lushai and Lakher tribes, with higher altitude and steeper slopes. Moreover, Shirep has practically no virgin forest for further extension of shifting cultivation, while Mampui still affords that opportunity. In Mampui the cultivable land is about 45% while in Shirep it is only about one-quarter. In these villages three types of paddy, oilseeds, cotton, groundnuts and pumpkins are grown though Mampui also grows maize and yam. Hunting, fishing and animal husbandry are other supplementary activities. Rice is the universal crop though oilseeds and maize are also occasionally noticed. A good proportion of the maize produced is for the pigs which are the most popular animals in the region. Industries are conspicuous by their total absence.

The Tripura Cachar Region

The Tripura-cachar region, covering an area of over 18,600 km² comprises of Tripura, an Union Territory, and Cachar and North Cachar districts of Assam, with about 2.54 million persons. As it represents a good combination of alternating plain and hill areas, the pattern of population distribution is very much imbalanced. Cachar district, which constitutes the upper portion of the Surma valley, is a level plain crossed by a number of perennial water channels. It happens to be the only sizeable tract in the whole of the Purvanchal where well-developed rail and road transport systems are available. Due to these favourable distinctions the district emerges as the most densely populated unit of this sub-region with a density of 199. Tripura, which is partly plain and partly hilly, records a density of 107. The portion of North Cachar is totally under hills and carries a very low density (19).

Unlike the other sub-regions of Purvanchal, this region comprises not less than thirteen urban centres, five of them, namely, Agartala (54,878), Silchar (41,062), Karimganj (28,683), Hailakandi (14,132) and Dharmanagar (13,240), having a population of over 10,000 each. This has not only raised the proportion of urban population in the area but also adds substantially to the general density.

Following the differences in the population density and nature of terrain and soil, the pattern of rural settlements also exhibits distinct characteristics from area to area. In the Cachar plain the settlements are large, compact and almost regularly spaced, the only factor disturbing the regularity being water-logging and resultant swamps. The western part of Tripura, which is also a plain though inferior in quality, is marked with medium-sized agglomerated villages. In the hills of North Cachar and even Tripura itself, small and scattered settlements become a rule in the same way as in most of the hilly areas of Purvanchal. The pattern of agriculture in the Tripura-Cachar region is marked with an appreciable deviation from tradition of *jhuming*, so popular in the rest of the Purvanchal. Though not totally abandoned, the shifting cultivation is confined only to hills, while the large expanse of the fertile plains is under permanent intensive cultivation. Moreover, irrigation facilities, improved variety of seeds and modern implements are common and higher per acre yields are obtained. Rice is again the most predominant cereal but a new cash crop—jute—is added. Oilseeds and cotton also give satisfactory yields.

Though the cropping pattern in the region is suited to a variety of agro-industries, sizeable manufacturing concerns are lacking. Leaving the usual handicrafts, industry is a monopoly of only small scale units which have multiplied in recent years. These comprise mostly tea factories, cotton ginning mills, tobacco-processing factories, oil mills, rice mills and saw mills.

Transport System

Among the many factors that govern the development of transport facilities, the nature of

terrain and availability of traffic are the most important. Unfortunately, in the Purvanchal both are in a discouraging pose. Not only the terrain plays a negative role in this context but the volume of traffic originating from or terminating in the region under survey is too small. As a result, it is found to be one of the most inaccessible tracts of the country, the links of various transport systems being confined only to a few specific areas. Cachar and North Cachar are the only districts through which passes an important line of the North-East Frontier Railway connecting Karimganj on the East Pakistan—Tripura border with Lumbding in Assam. In Cachar two small lines to connect Silchar and Lalaghat with the above mentioned main line have also been constructed. In addition, the only rail connections like those at Likhapani in NEFA and Dimapur in Nagaland are available. However, the region finds a few important outlets through metalled roads. The National Highway no. 39 is the most important road which crosses the region running from Tamu on the Indo-Burmese border to Golaghat in the Assam valley. The highway interlinks the two capital towns, Imphal and Kohima. The Highway no. 38, which runs from Dibrugarh on the Brahmaputra to Likhapani in the Eastern Tirap, makes a transverse traverse in the upper reaches of the region. The roads linking Silchar with Lungleh and Karimganj with Agartala are the only two other links which maintain an inter-regional character. In the Tripura-Cachar region and the Imphal valley examples of well developed internal road systems may also be noted.

The channel of river Barak where country boats ply in between Silchar and Karimganj is the only example of internal waterways in the region. The steep gradient of slopes has made the development of waterways quite impossible.

Seeing the backwardness of the region with respect to its rail, road and water transport systems there is a need of extending air transport system. Between Silchar and Calcutta daily flights are run by the Indian Airlines Corporation. Freight-carrying services between Imphal and Calcutta, and Agartala and Calcutta are also maintained by the same airlines.

The Regions

In spite of a strong unity by way of an overall homogeneity in its historical background, a generally hilly terrain with the associated physical and cultural character with tribal overtones the region exhibits, if viewed in detail, considerable diversity. It is thus possible to distinguish two first order, five second order and 13 third order regions (Fig. 12.7) as follows :

Regional Scheme

XI. Purvanchal

23. Furvanchal North

- (a) Lohit-Tirap Region
 - (i) Upper Lohit Valley
 - (ii) Tirap-Noa Dihing Valley
- (b) Nagaland
 - (i) Nagaland West
 - (ii) Nagaland East

24. Furvanchal South

- (c) Manipur Region
 - (i) Imphal Valley or Central Plain
 - (ii) Manipur Hills West
 - (iii) Manipur Hills East
- (d) Mizo (Lushai) Hills Region
 - (i) Mizo Hills West
 - (ii) Mizo Hills East
- (e) Tripura-Cachar Region
 - (i) Tripura Plain
 - (ii) Tripura Hills
 - (iii) Cachar Plain
 - (iv) North Cachar Hills.

The limit between the two first order regions, the Purvanchal North and the Purvanchal South, has been defined with reference to the political boundary between the State of Nagaland on the north and the Union Territory of Manipur and the State of Assam on the south. Due to north-south elongated shape of the Region, the internal variations are most prominent in that direction. The boundary happens to be a natural watershed between the streams draining towards south and those towards north-west and north-east. Besides distinct differences in the climatic attributes, relief and population density of the two regions are well-marked.

For delimiting the second order regions recourse was taken to the political boundaries in between Nagaland and NEFA, Manipur and Assam (Mizo Hills), and Tripura and Cachar. The region lying to the north-east of the State of Nagaland is dominated by its two streams, the Tirap and the Lohit and hence the name Tirap-Lohit region has been assigned. Nagaland State itself is found to be an independent geographical entity on the basis of its homogeneous physiography, climate, soil, Naga population and culture and the preponderance of *jhuming* cultivation; hence a second order region in the name of Nagaland. To the south of Nagaland there lies the Union Territory of Manipur with a typical arrangement of its circular rim of hill ranges surrounding the central plain, a series of different tribes with some common characteristics and a well developed trellis drainage pattern. These factors have led to the evolution of a distinct socio-cultural pattern, the Manipuri culture; thus distinguishing it as a second order region. The longitudinal ridges and valleys of the Mizo Hills district, occupied chiefly by the Lushais or Mizos, impart a distinct regional character to it. The southwest-northeast elongated belt stretching over the Union Territory of Tripura, and the Assam districts of Cachar and parts of North Cachar is a continuous zone of alternating hills and plains, the latter dominating, occupied chiefly by non-tribals with permanent, intensive and progressive agriculture and a considerable proportion of urban population. Thus Tripura-Cachar emerges as a second order region.

The Tirap-Lohit region is divided into two third order regions—the Upper Lohit Valley and the Tirap-Noa Dihing Valley, the district boundary between Tirap and Lohit of NEFA being the dividing line. The Upper Lohit Valley is distinct by its high mountains, cool weather, a very low density and some particular ethnic groups. The region named as the Tirap-Noa Dihing Valley is a highly dissected land with a comparatively high density. The north-south aligned central water divide of Nagaland which also follows, for a long distance, the district boundary between Mokokchung and Tuensang

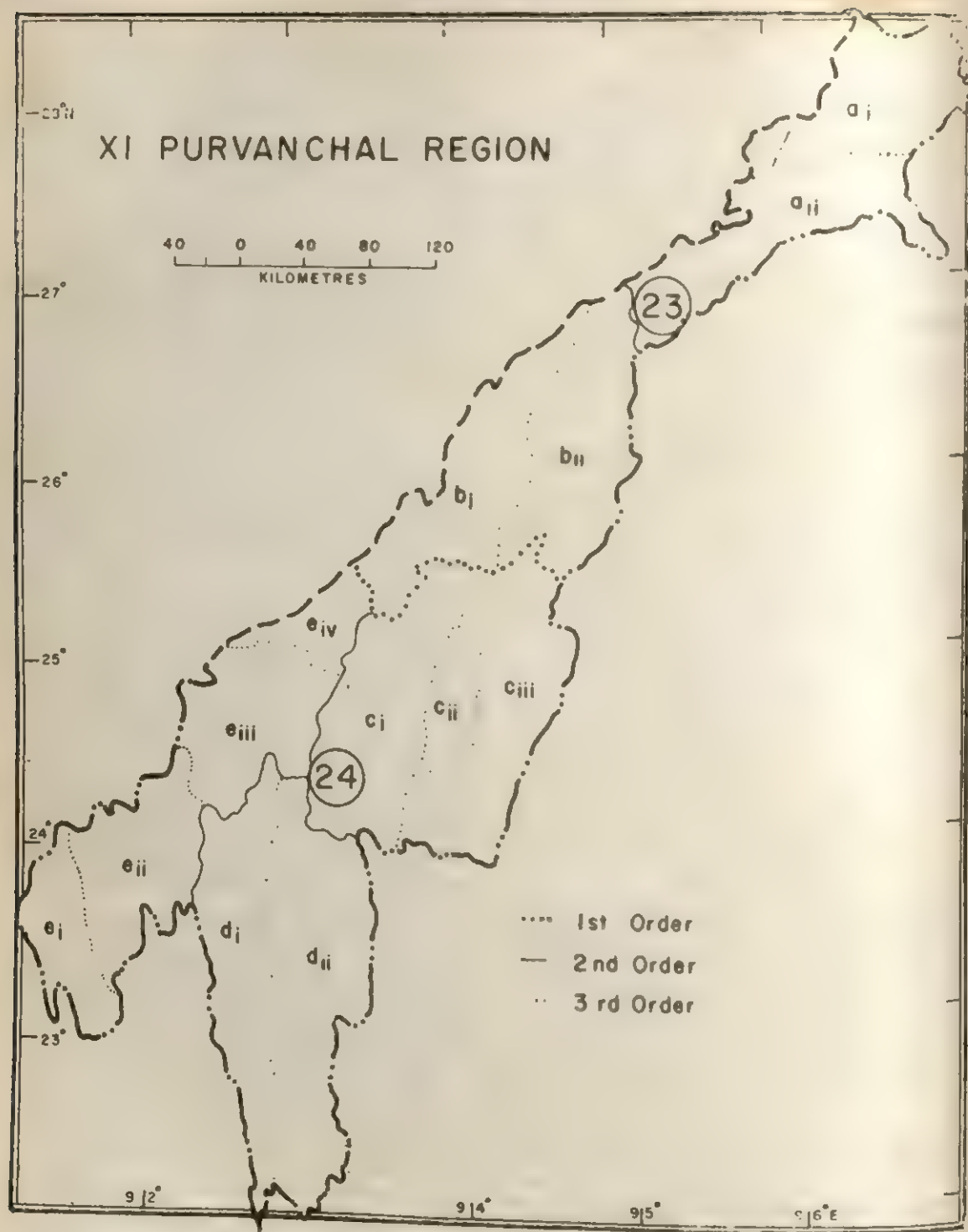


Fig. 127

PLATE X



A view of a highway in Naga Land



The Terraced fields in Naga Land



Suraj Pole circle with a fountain, gate and city Palace, Udaipur



A view of Fateh Sagar, Udaipur through the circular canal

is taken as the dividing line in between Nagaland West and Nagaland East. Nagaland West receives lesser rainfall, possesses lower relief and a higher population density as compared to the Nagaland East. In Manipur the Central Plain presents a sharp contrast to the surrounding rimlands in many ways as discussed in the foregoing. The western half of the Manipur hills is different from the eastern half. As such, Manipur is divided into three third order regions—the Imphal Valley, Manipur Hills West and the Manipur Hills East. In the western portion of Mizo Hills the valleys are wider, relief lower and rainfall higher, as compared to the eastern portion. Further, in the western half the settlements cling to the valley-flats while in the eastern half they follow the crests. As such, the Mizo Hills fall into two third order regions, i.e., Mizo Hills West and Mizo Hills East. The Tripura-Cachar region consists of four separate alternately arranged physiographic units—the Tripura plain, the Tripura hills, the Cachar plain and the North Cachar hills which are also distinguished by various cultural and economic factors. The hills are inhabited by tribes dependent on *jhums* while the plains are densely settled by Bengali and other non-tribal population.

Problems and Prospects

The problems and prospects of the Purvanchal are similar to those of the Eastern Himalaya, sharing much in common with Assam as a whole.

Any development cannot be envisaged without effectively integrating different tribal territories amongst themselves on the one hand and with North Eastern India as a whole on the other. The first need is to open up this area to the rest of the country as well as to interlink the various territories within the region itself by developing efficient road-net. Though the headquarters of the various units are mostly linked among themselves by air, surface roads of national highway-type linking Gauhati, Shillong, Kohima, Imphal, Silchar, Aijal and Agartala need be provided, and the regional links will follow in their train. The prevailing shifting cultivation may have considerable carrying capacity from the point of view of local terrain but its transformation into settled agriculture by harnessing river water both for irrigation and power is the basic necessity for the development of the regional economy. Through the spread of liberal and technical education and carefully induced social reforms, local talents for crafts and cottage industries may be fully channelised for organised and integrated production, and through the development of forest and mineral-based industries, the region will be able to make considerable contribution to its own well-being as also to the national economy. Above all, care has to be taken in this vital and sensitive area so that the modern developments are gradually assimilated by the people to their advantage without losing their identity.

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PENINSULAR UPLANDS

as a macro region is one of the most stable surfaces of the earth sheltering in its bosom relicts of Physico-cultural features of all ages. Rich in natural resources with considerable variety of population and socio-economic patterns, it provides stability to the country as a whole.

The Udaipur Gwalior Region ($72^{\circ}7' - 79^{\circ}5' E$ and $23^{\circ}20' - 28^{\circ}20' N$) commands an area of about 167,872 km² with a population of about 16 million (90 persons/km²). It comprises mostly the eastern part of Rajasthan, NW part of Madhya Pradesh, contiguous to Malwa and Bundelkhand,

and a small part of Gujarat (parts of Banaskantha and Sabarkantha districts). From here starts the triangle of the Central Highlands of India with the Aravallis forming the core and the Chambal-Sindh basin framing the NE flanks overlooking the Upper Ganga plain (Fig. 13.1).

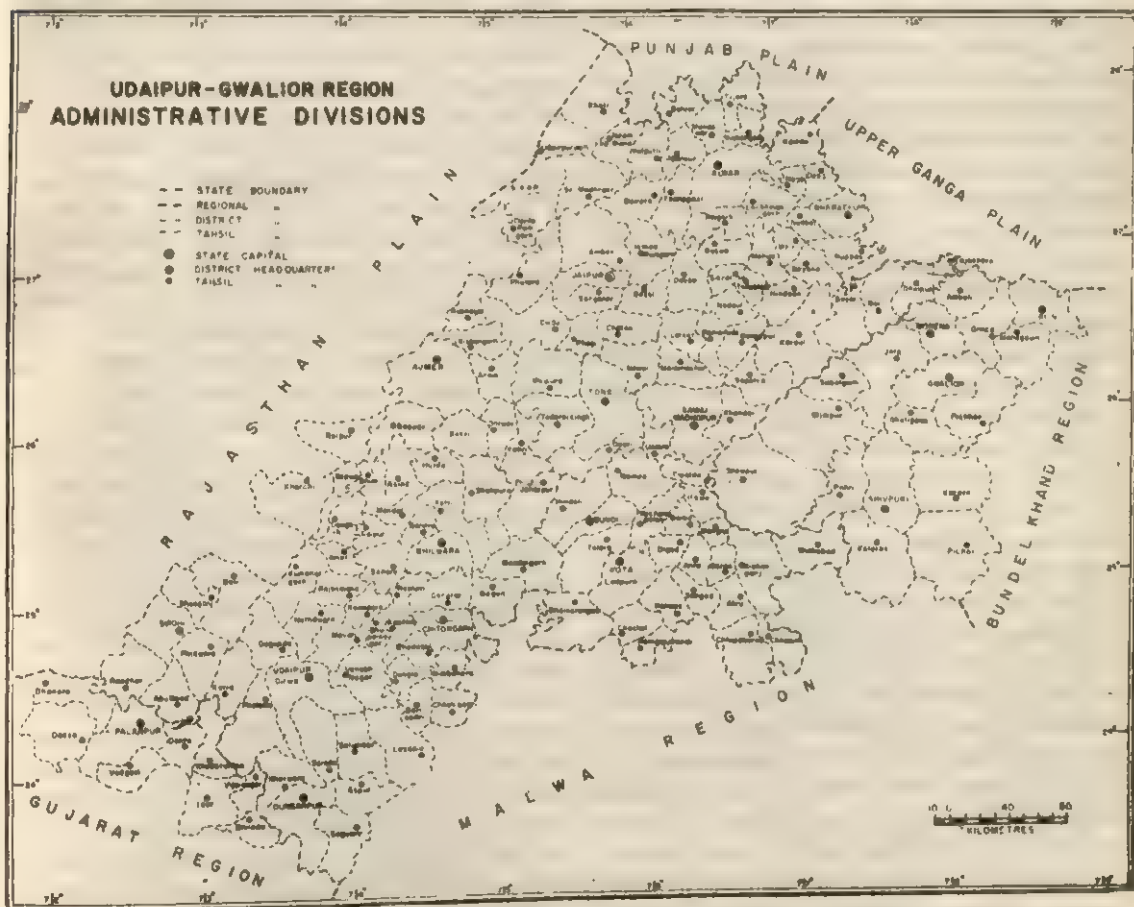


Fig. 13.1

Historical Background

The annals of Rajasthan dominate the regional history and have played a vital role in determining the framework of Indian History; the Aravallis in particular, which have formed the backbone, are associated with the

"Deeds which should not pass away,
And names that must not wither".¹

Between the nuclear region of the Ganga valley and the Delhi-Agra axis on the one hand and the Deccan on the other, the region with the contiguous Malwa has been the marchland of the Indian history as also the heartland for refuge and consolidation of tribal as well as freedom-loving peoples such as the Bhils, the Rajputs, the Jats² etc., who dominated the scene for centuries.

The area was settled easily by the pre-Aryan people as is evidenced by the relics of Virat (modern Bairat in Jaipur), the capital of the Matsyas³ and the Pushkararanya (modern Pushkar in Ajmer) which is regarded as the oldest non-Aryan (Daitya Dundha) settlement and capital. The Dundhar (modern Dundhar) in Sikar district, on the other hand, is regarded as the first Aryan settlement founded after killing Daitya Dundha.⁴ Mahabharata records the Salvakas with their capital at Salvapur (modern Alwar) and some other settlers like the Vaidhans, with their capital near Chittor.⁵ In the Jain texts (400 B. C.) the Matsya territory is mentioned as one of the sixteen Mahajanapadas⁶ and Pushkar as a seat of Buddhism as also a flourishing town.⁷ The later period saw the rise of several janapadas and dynasties which were periodically under the great national empires of Magadha, Kushans and the Guptas. With the weakening of the Central authorities, the Gurjars, Pratiharas, Chauhanas, Mauriyas, and Gahlotas (Guhilotas) founded their independent kingdoms respectively at Bhimal (Jalore), Sakambhari (modern Sambhar), Chittor and Nagdriha (modern Nagota near Eklingji in Udaipur) and Chaksu (Jaipur)⁸. The later history is punctuated by internecine warfare of various Rajput dynasties such as the Shavadas, Raghuvanshis, Pratiharas, Solankis (of Gujarat), Parmaras (of Malwa), Guhilots, Gurjars, Chauhanas, and Kachwahas, leading to the establishment of

several kingdoms within the region. Even when the Central authority in the Ganga Valley or in the Delhi-Agra axis (Sultans of Delhi) attempted to establish their supremacy in this region, the heroic Rajputs were able to maintain their strongholds, though they were periodically subdued by one another amongst themselves. Even the Moghuls could hold their suzerainty for about two centuries by alliance or war though Mewar could retain its independence for long.

With the decline of Moghul power (1707) the regional chiefs like the Jats of Bharatpur and Dholpur became independent and Marathas as a significant power became more active in the regional politics. Sindhia founded the powerful state of Gwalior, the Hadas (Chauhan) ruled the principalities of Kota and Bundi, having earlier won the territories from the Bhils. The territory of Bhadaurias (Bhind and Morena) became a part of Gwalior State. The Maratha power⁹ was ultimately subdued by the British inroads into Central India which resulted in the disintegration of the region into a large number of princely states excepting Ajmer which was controlled directly and even Sindhia was compelled to accept their paramountcy. These states could gratefully acknowledge their role as "break waters in the storm (the first war of the Indian Independence, 1857) which would have swept them". The Sindhia withstood all the pressure for joining the National movement led by the Rani of Jhansi (Lakshmibai), Tautya Tope, etc. Till India became independent, these states often served as a wedge against nationalistic movements, and even at the time of Independence these states had been given option to decide about their status. However, thanks to the statesmanship of Sardar Patel, their integration with the rest of the country could ultimately be achieved. Bharatpur, Dholpur, Karauli, alongwith Alwar formed the Matsya Union (March 17, 1948); later (May 15, 1949) Kota, Bundi and Tonk, alongwith other neighbouring states joined this union which with the addition of other states finally emerged as the state of Rajasthan (1956) with the promulgation of States Reorganisation Act. Similarly on May 28, 1948, Gwalior state was merged with 24

states to form the State of Madhya Bharat which was subsequently amalgamated into Madhya Pradesh (1956).

The Physical Setting

Geology

Geologically the region forms part of the Archaean shield of the Deccan Peninsula which consists of the well-foliated, highly contorted and faulted gneissic basement complex. Since then it has presumed the imprints of all the major geological events in some form or the other though the main formations outcropping in the region are confined only to the Dharwarians (Aravallis) and the Vindhya, separated by the "Great Boundary Fault".

The Archaean sediments were uplifted marking perhaps the first orogenic movement, recognisable in earth's geologic history, and giving birth to the Aravallis which since then have dominated the regional landscape. "Evidence exists that this mountain chain received renewed upheavals during the early Palaeozoic and was of far greater proportions in past times, and that it stretched

from the Deccan to perhaps beyond the limits of the Himalayas."⁹

Structurally the Aravallis represent a synclorium, filled with rocks of the Aravalli and Delhi system and bear the marks of intrusions of basal gneisses and granites, definitely older than the two. The Aravallis have undergone intense metamorphism, though the degree of metamorphism decreases south-eastward from the central axis so sharply that at a distance of about 250 km "there extends a belt of comparatively little altered sediments which are buried to form part of the Aravalli sequence and which may be referred to as the Gwalior facies."¹⁰

The Aravalli system is largely composed of argillaceous deposits, metamorphosed from shales through slates and phyllites to mica schists outcropping around Alwar, Udaipur, Ajmer etc. While the Raialo series consists of the metamorphosed limestones, gneisses, phyllites and schists with quartzitic intercalations occurring in Makrana, Nagaur, Nathdwara, Rajnagar etc. (Fig 13.2).

On the south-eastern fringe of the region which escaped intense metamorphism the Gwalior and

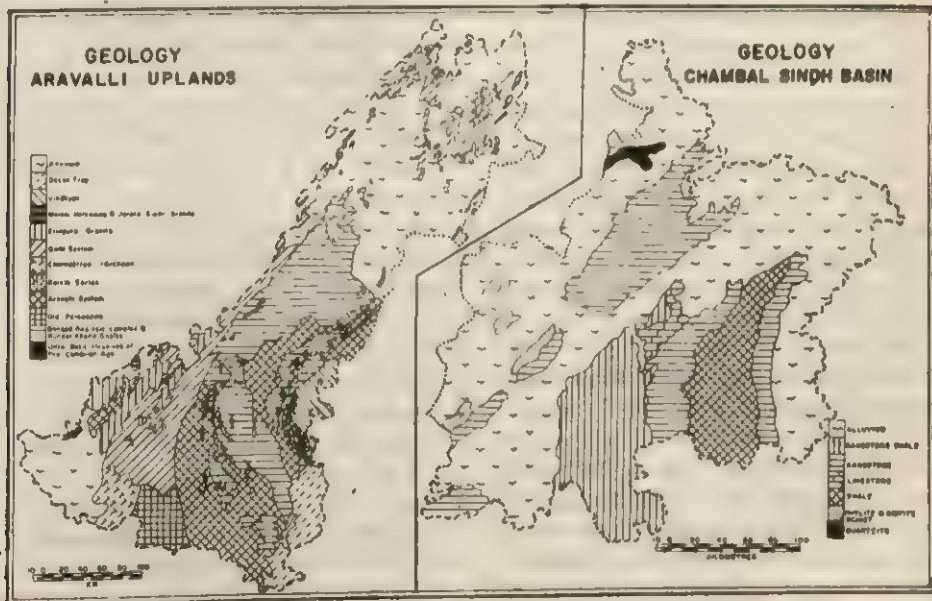


Fig. 13.2

Bijawars are found probably on a relatively elongated granitic platform whose "junction with the Bundelkhand granite marks one of the oldest shorelines recognisable in India and is equalled only by that discernible in Mewar."¹¹ The Gwalior series distinguished into the Lower (Par Series) and Upper (Morar Series) consists mostly of sandstones, quartzites, siliceous limestones and dolomites.

The most typical development of the Vindhya occurs south of the Chambal in Madhya Bharat area, though its extensions up to the Aravalli flanks and beyond are also well-marked. The lower Vindhya (the Semri series) are well exposed in Karauli tableland and extend through Sawai Madhopur to Bundi and Kota. "The junction of the Upper Vindhya with the older rocks of the Aravallis at their north-west extremity reveals an extremely long fault of great throw, which has brought the undisturbed, almost horizontal strata of the Vindhyan sandstone in contact with the highly folded and foliated schists of the Aravallis. This great fault which has a throw of 1,500 m is roughly parallel with the course of the Chambal and can be traced from the western limits of the outcrop as far north as Agra, a distance of 800 km. It is possible that this junction is not of the nature of the ordinary fracture or dislocation, but marks the approximate limit of deposition of the younger Vindhyan sandstone against the foot of the Aravallis which was modified subsequently by faulting and thrusting. The faults, therefore, is of the nature of the Boundary Fault which recalls the much better area of the junction of the younger with the older Tertiaries of the Himalayas."¹²

The region appears to have undergone peneplanation in the later Mesozoic and subsequently it experienced warping. Probably a second stage of peneplanation occurred during the Tertiary and Pleistocene whereby the regional relief was greatly subdued.¹³ This phenomenon of succession is amply demonstrated by the Banas which is *par excellence* a super-imposed stream.

The alluvial deposits belong to Recent and sub-Recent periods. The aeolian accumulations of sand also belong to the same period. The

ravines flanking the Chambal and its Tributaries are of much recent origin.

Relief

The Region has a varied topography which is the result of its geological history as well as the exogenetic forces that have gone into its making. The denudational chronology of the regional landscape from pre-Cambrian to sub-Recent period, peneplanation, warping, intrusion and deformation, have produced many relict features which are represented by the outliers of the Aravallis as well as the Vindhyan scarplands. The Banas plain in Tonk and Sawai Madhopur districts in Rajasthan also presents testimonies of the erosional surfaces of many periods embedded in granitic and gneissic rocks under covering of alluvial deposits. It is essentially a peneplain.

The region presents a queer and confused amalgam of low land and upland topography (Fig. 13.3). The 150 m contour encloses a small portion in Bhind and Morena districts particularly along the river valleys. The dominance of the lowland is highlighted by the 300m contour which takes long sweeps including the Mahi Basin, the Chambal-Sindh Plain as well as the lower Banas Plain and Bharatpur Plain. The Kota (Harawati) Plain formed by the Chambal and its tributaries, the Kali, Sindh and the Parbati, varies in altitude from 215 to 275 m. The area above 450 m is limited to the southern and south-western parts of the region including the Shivpuri Plateau and the southern and western parts of Kota (Harawati) Plateau. The eastern ranges are mostly the outliers of the Aravallis, running from Mandalgarh in Udaipur Division across Bundi to near Indargarh in Kota district as well as the Mukundwara range running across the south-western part of Kota district from the Chambal to beyond Jhalrapatan seldom exceed 510 m altitude, so also the Karauli hills north of the Chambal scarps, while the highest point (Alipur) in Bharatpur plain is only 417 m above the mean sea level.

Physiographically the region can be divided into two units : (i) The Aravalli range and hill tracts and (ii) the Eastern Plains.

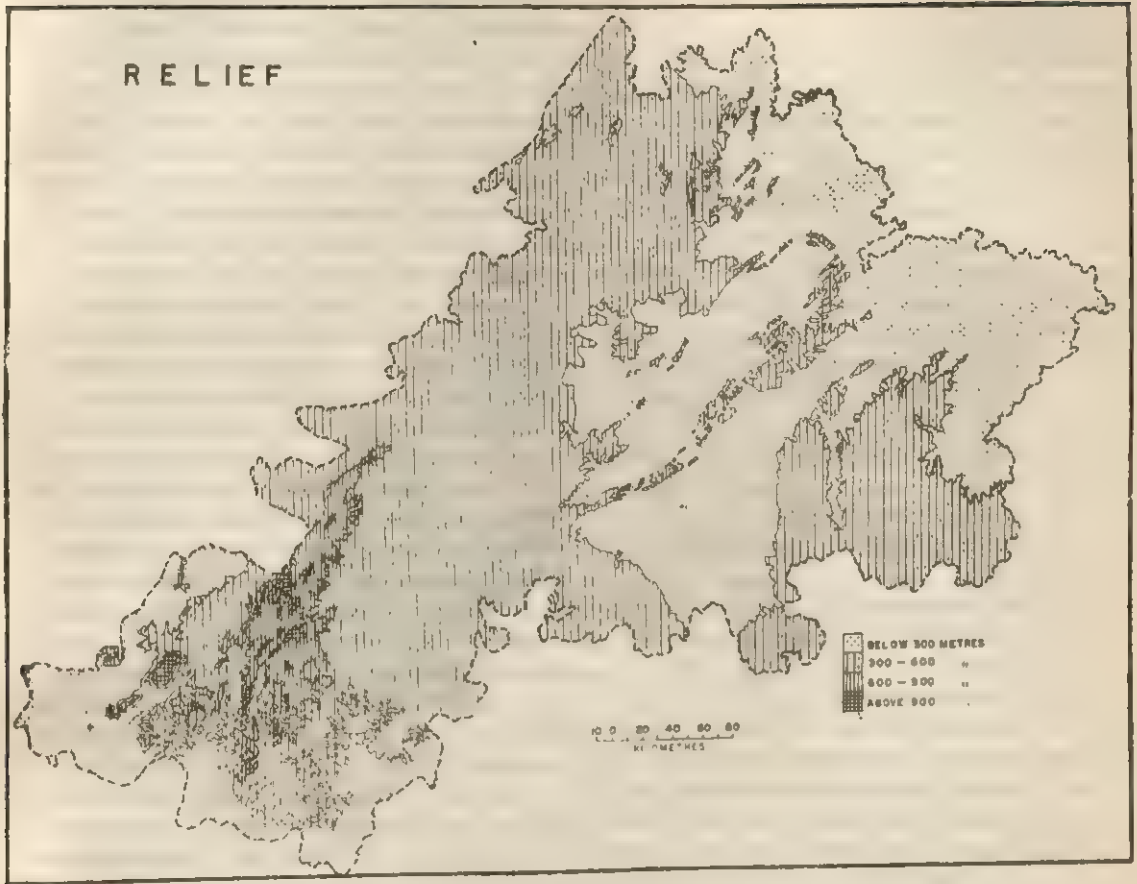


Fig. 13.3

The *Aravalli** range running across the region like a curved Scimitar from S. W. to N. E. is the principal and the dominant landform of the region. This range though not of uniform width extends for about 692 km from Palanpur in Gujarat to Delhi. The loftiest and most clearly defined section of the Aravalli range is in the Mewar and Merwara hills where it forms an unbroken range. Beyond Ajmer it breaks up into straggling and discontinuous hills. The successive hills and rocky eminences stretch north-eastwards west of Sambhar Lake through the districts

of Jaipur, Sikar and Alwar up to Khetri (Jhunjhunu district), where it almost terminates though detached hills can be seen as far as Delhi.

In plan, the Aravalli range appears somewhat like 'two fans joined handle to handle'. The handles of the fans meet north of Ajmer, from where the range opens out in form of Mewar Hills in the South and Alwar hill tracts in the North.

The Aravallis of Mewar are principally composed of easily eroded phyllites which have given rise to a monotonous rolling country intersected by ramifying shallow valleys. The more consistent and continuous structural characteristics throughout the Aravallis are the quartzite formations which because of their superior resistance

* The Range is said to be identified with the 'Apocop montes deorum peona appellati' of Ptolemy and with 'Paripatra' of Vishnu Purana.

to denudation have remained in the form of flat-topped ramparts.

In the Aravalli region, wherever granite is of common occurrence deflation and diurnal range of temperature have produced queer features of jagged outline with the smooth desert *patina* covering their cracked interiors, while the granites are exfoliated and honey-combed into domes and tors, with perched blocks and boulder-like cannon balls and sacks. This is specially the case with Erinpura granites¹⁴ around Idar, Mt. Abu, Erinpura and Beawar.

The whole of the Aravalli range and hill tracts can be subdivided into the following physiographic units

1. The North Eastern hill tracts or the Alwar hills.
2. The Central Aravalli range.
 - a) The Sambhar basin or Shekhawati low hills.
 - b) The Merwara hills.
3. The Mewar hill and Bhorat Plateau.
4. Abu Block.
5. The Vindhyan Scarps.

The North Eastern hill tracts consist of many isoclinal ridges of rocky and precipitous hills in most parts of Alwar and North-western Jaipur. Their offshoots to the west are found in Sikar, Shri Madhopur, Neem-ka-Thana and Khetri tahsils. The valleys between the hills are wide and in some cases stretch for many kilometres. Flattened hill tops form small plateaus. To the east and north it merges with Ganga-Yamuna Plain. Its average elevation varies between 300-670 m though Bharaich (792 m), Bairath (704 m) in Alwar, Babai (792 m) and Kho (920 m) in Jaipur and Raghunathgarh (1,055 m) in Sikar are some of the peaks more than 700 m.

The Central Aravalli range : It may further be subdivided into two geomorphic units : a) The Sambhar basin or the Shekhawati Low hills : The landscape of this region is marked by sand hills and low depressions with inland drainage. After the rare heavy showers rainwater is accumulated in innumerable local depressions surrounded by sand hills. Several small basins are found around the Jaipur-jodhpur saddle. Because of high

temperature, the evaporation of the saline flood water results in the deposits of salt and soda at different places in these depressions. Sambhar, Nawa, Kuchaman, Degana and Didwana are important salt lakes, of which only the first two are within the region. Of these, the Sambhar lake is the largest, about 65 km west of Jaipur. Stretching in east-west direction, it is about 25 km long and the width varies from 4.5-16 km during the rainy season; it is really a playa. It is very shallow and during summer it is almost dry and shrinks to a mere central puddle. The average height of the region is 400 m but to the west of the Sambhar lake in Parbatsar and Nawa Tahsils of Nagaur the height reaches 500 m, where the off-shoots of the Aravalli range are observable.

(b) The Merwara hills appear in the parallel succession of hills in the vicinity of Ajmer city which itself is situated on a plateau (625-800 m), marking the highest point on the northern plain; from Kukra, a succession of hills and valleys extend to the farthest extreme of Ajmer district, where they imperceptibly merge into the Mewar hills. The hills on the western side become very bold and precipitous. The average level of the region is 550 m.

The Mewar hills and Bhorat Plateau : The highest portion of the Aravalli range, except the Abu Block, lies N.W. of Udaipur between the fort of Kumbhalgarh and Gogunda, in the form of a plateau, locally known as 'Bhorat' having an altitude of nearly 1,225 m. From it, bold strike ridges of the Alwar Quartzites, with almost level tops project to about 300 m and some of the peaks to more than 1,300 m above sea level, while the highest point rises to 1,431 m at Jarga Parbat.

Bhorat Plateau and its adjacent ridges form a sort of complex knot from where a number of spurs and curved ridges branch off practically in all the directions.

To the S. W., S. and S. E., these spurs and curved ridges reach upto eastern Sirohi, Dungarpur, and northern Sabarkantha in Gujarat and are separated from one another by the north-south flowing river valleys of the Sei, Sabarmati, Wakan and Som respectively from west to east. The

average height is 500-1,000 m, while the loftiest point is 1,290 m near Jharol, west of Bagpura plateau. The western most ridge in East Sirohi, though of no great height, is steep and rugged, locally known as Bhakar.¹⁵ Around Jaisamand lake, the hills and ranges rise to 820 m, whereas the lake area is below 300 m. Further eastward from Jaisamand is a dissected plateau of Lasadia (325-650 m) which presents a hummocky and irregular relief. From here the off-shoots continue up to Pratapggarh.

To the east from Bhorat plateau are several spurs of which the southern most spur (500-600m), which not only separates Udaipur basin from Jaisamand basin but also acts as a major watershed between the Bay of Bengal and the Arabian sea drainage systems, is the most important. Some of the hill spurs girdle the saucer-shaped Udaipur basin, locally known as *Girwa* (girdle of hills).

North-eastwards from Bhorat Plateau the Aravalli range merges imperceptibly with rolling high plains (500 m) and to the north it gradually loses its width to become Merwara Hills near Todgarh.

The rest of the Mēwar hills are comparatively insignificant. East of Chittorgarh is a series of hills (600 m) all running north-south and forming narrow confined valleys parallel to each other.

The Abu Block : The Aravalli range has been detached in south-western parts and spreads in the form of cluster of hills in Sirohi and northern Banaskantha district of Gujarat. The prominent feature is the almost isolated hill mass of Abu. It has been separated from the main Aravalli range by the wide valley of the West Banas and by a narrow pass near the village of Isra from Abu-Sirohi range in the west. Mt. Abu is a long (19 km) and narrow (6 km) plateau, nearly 1,200 m above sea-level. It is an irregular plateau surrounded by several projected peaks. The natural features are very bold and the slopes, particularly on the western and northern sides are extremely precipitous; on the east and south, the outline is more broken by spurs with deep valleys in between. The most striking features are the gigantic blocks of syenitic rocks, towering along the crest of the hill, in some cases so wea-

ther-worn as to present the most fanciful and weird shapes, while in other they appear so slightly balanced as to be in danger of rolling down. In places, the face of the cliff has been moulded into rounded caverns and holes resembling the section of a largely magnified sponge, while the brown often overlooks an absolute precipice 100-150 m of sheer descent.¹⁶

Attached to Mt. Abu is Oria plateau about 160 m higher than Abu and lies below the main peak of Guru-Sikhar, a great granitic mass-transliterated by James Todd as 'the Saint's pinnacle'—with the towering elevation of 1,722 m is the loftiest peak between the Himalaya and the Nilgris. Other prominent peaks adjoining Guru Sikhar are one near village Ser (1,597 m), Achalgarh (1,380 m) and the three peaks west of Delwara.

To the west of Mt. Abu are Abu-Sirohi ranges—the lower skirts and outlying spurs of the Aravalli range, much lower than the Abu ranges. Further westwards are groups of scattered hills and become denser in Palanpur (Gujarat).

The Vindhyan Scarps : formed by sandstones mark the topography in Chambal and Sind basins, particularly in the districts of Kota, Shivpuri, Gwalior and continue north of Chambal with projections into the Bharatpur plain.

The Eastern Plains : The Plains include the lowlands of the Chambal basin, the Banas Plain and the middle Mahi or Chappan Plain. The plains of Bharatpur, Morena and Gwalior appear to be the extensions of the Upper Ganga Plain and the Kota Plain is virtually an extension of the Morena Plain; but the Banas Plain though an alluvial tract is rather a peneplain. The middle Mahi Plain is a tangled wilderness of valleys known as *Chappan*, covering parts of Udaipur, Dungarpur, Banswara and Pratapggarh and draining to the Arabian Sea.

The Plains of the Chambal-Sindh Basin present rather a homogeneous topography for hundreds of km characterised by flood plains, river bluffs, interfluvies and ravines which are best developed in the region. "These Chambal low lands are of a character peculiar to themselves, sometimes forming the floors of vast hollows in the ravines, far, perhaps from the river but only just above the usual level of its stream; sometimes skirting the

beds of the ravines themselves, they elsewhere rise in wavy and irregular hillocks from the water's edge or beside it from a tip of low but fertile fields."¹⁷

Taking the average width of the ravine belt about 10 km the total area affected is approximately 4,500 km² in the districts of Kota, Bundi, Tonk, Sawai Madhopur and Bharatpur in Rajasthan and Morena, Bhind and Gwalior in Madhya Pradesh. The most dominant is the Chambal belt extending over a length of 480 km from Kota to Bhareh. On the north, from Kota to Dholpur, an irregular and high wall of the upper Vindhyan scarplands, is marked by the watershed between the Banganga (Utangan), a tributary of the Yamuna and further on by the Yamuna itself. The southern boundary fluctuates with the tributaries viz., the Kali Sindh, the Parbati and the Sip etc., and further on it is well marked by the ravines of the Kunwari throughout the south-easterly course of the Chambal up to Bhareh.

"Severe gullying, possibly initiated by rejuvenation but aggravated by misuse of the land, make this perhaps the worst area of erosion in India, particularly towards the edge of the foreland."¹⁸ Analysing the historical evidence it is concluded that "most of the erosion and ravine formation has occurred during the last 400 years". The old Moghul Imperial road ran along the head of the ravines and many of the old masonry pillars making the *ker* marks (milestone) are still standing; but the ravines have in many places eaten into and across the old lines of the road. The villages which have been entangled in the labyrinth of ravines, give a clue that originally they were not situated in the ravines, but along the river for the facility of water supply. Today these villages are badly infested by the encroaching ravines, and in many cases the ravines have spread much further ahead, desolating those villages in a terrain of hummocky knolls.¹⁹ Evidences show that formerly there were dense forests covering these tracts, but with the increasing pressure of population, the inhabitants ruthlessly cleared the land for cultivation. The plain area between the ravines of the Chambal and the Yamuna and that between the Chambal and the Kunwari is

under cultivation. Before the formation of the ravines, these tracts might also have been under cultivation, but today they are waste lands, and the cultivation is constantly shifting with the headward erosion of the ravines.

The *Banas plain* is limited by 50 cm isohyet to the west, great Indian watershed to the south, Alwar hill tracts in the north and the Vindhyan Scarp in the east. Drained by the Banas and its tributaries, the plain may be called Mewar plain in the south and Malpura-Karauli plain in the north.

The Mewar plain or 'the stony plain of Mewar', is a dissected plain of Archaean gneiss. The plain gradually slopes towards the east and north-east with an average height of between 280-500 m. With numerous isolated hills of circumdenudation, it is hummocky in its higher portion and may be called a piedmont plain. The Banas and its principal tributaries viz. Berach, Chandra-bhaga, Kothari and Khari flow through this plain.

The Malpura-Karauli plain, recognized as 'Tertiary Peneplane'²⁰ is mostly composed of schist and gneiss. The alluvial deposits are thick in larger parts of Kishangarh and Malpura, where they bury most of the gneissic rocks below. With an average elevation of 280-400 m, the plain slopes gently towards S.E. and E.

Middle Mahi Plain : The gradient of this plain is much steeper (8-12 m per km) than the other plains of the region, with an average elevation of 200-400 m. Consequently it is deeply and intricately dissected leading to the formation of isolated hillocks. This dissected plain along with hill tracts of Banswara and Dungarpur are locally known as *Bager*.

Drainage

The drainage system of the region is influenced by its geological history and location. The great Indian water-divide (the Aravallis) separates the Arabian Sea system including the western Rajasthan drainage system (mostly inland) from the Bay system (the Ganga system) through the Yamuna which is fed by the Chambal, the Banganga, the Kunwari and the Sindh etc. (Fig. 13.4). Probably the Chambal system is older than the Yamuna which formerly belonged to the Indus

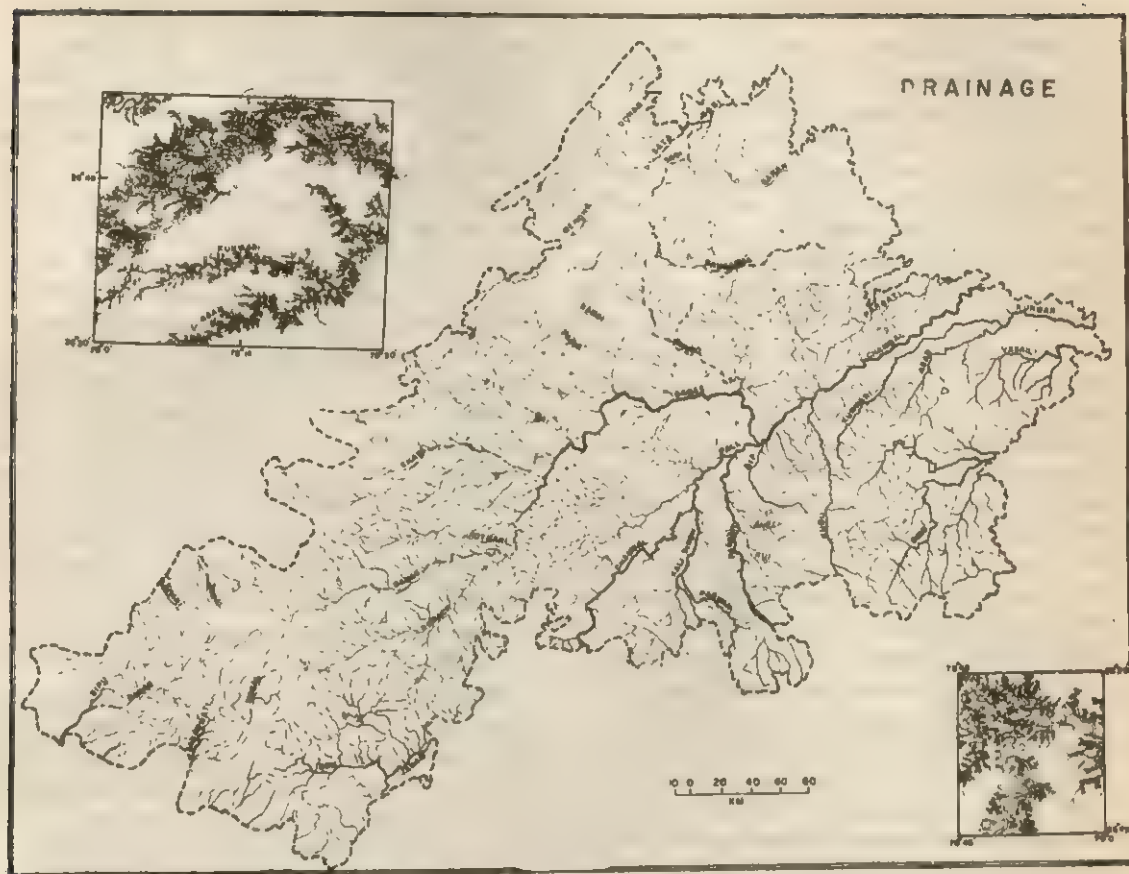


Fig. 13.4

system in the Tertiary and Holocene periods. Due to subsidence in the Ganga delta and the later uplift in the Aravalli—Delhi axis, the Yamuna changed its course, became a tributary of the Ganga and usurped the catchment areas of the Chambal and other streams of the central Foreland. The great boundary fault helped in building the Chambal River system which is a typical example of a consequent (also superimposed) stream. The dendritic patterns of the main streams are quite clear. The long profiles of the river valleys indicate that they have virtually attained the base levels.

The master stream of the region is surely the Chambal (the ancient Carmanvati) which rises from Janpao spur of the Vindhya near Mhow. For about 325 km it flows in northerly direction

through a deep and narrow gorge at Chaurasgarh where it drops to 505 m from 884 m (near its source). Again it enters a gorge for about 113 km and leaves it near Kota to run through the plain in a north-easterly direction till it embraces the Yamuna with a south-easterly bend after completing a journey of 965 km near Muradganj. Below Kota it is first joined by the Kali Sindh and 48 km down stream by the Parbati on its right. The Banas rising in the Aravallis near Kumbhalgarh, flows through the heart of the Mewar plains and is fed by the Berach, the Kothari, the Khari, the Dhund and the Morel. Completing a journey of about 480 km it ultimately joins the Chambal.

The Chambal has excellent sites and resources for the development of cheap hydel power and

irrigation facilities. The Chambal Valley Development Scheme was launched in 1953 which envisaged the construction of three dams (Gandhi Sagar, Rana Pratap Sagar and Kota) and a barrage (Kota) for generating 2.28 lakh kw of hydel power and irrigation potential for 5 lakh hectares.

The Sindh has its own drainage system which occupies the north-eastern part of the Region. It has a number of tributaries, the most important being the Vaisali, the Sankh, the Parbati and the Pahuj. It has a typical dendritic pattern and has great potential water resources which, however, are of limited value for irrigation purposes because of its high banks.

To the west of the Aravalli watershed flow several smaller streams joining the Luni River draining into the Rann of Cutch. The Saraswati, carrying the drainage of the Pushkar Valley joins the Sabarmati, a tributary of the Luni. Being purely rainfed streams, these come to life only during rainy seasons and even then get choked with advancing sands at places. The Sabarmati along with its tributaries the Sei, the Wakal, Hathmati etc., flows southwards to the Gulf of Cambay. South of the Aravalli axis is drained by the Mahi through Som and its tributaries. It is the only river which rises from the Vindhya and flowing northwards and separating Banswara from Udaipur and Dungarpur, drains into the Arabian sea. It is a perennial stream but shrinks into a narrow channel and rocky pools during summer and after rains becomes impassable for days together.

Around Sambhar is an inland drainage area. Numerous rivulets from the adjoining area flow towards this central lowland, and get lost in the sands.

Flowing in a NE direction to terminate in the Najafgarh lake (Gurgaon district, Haryana), the Sabi is the largest river of Alwar. The Ruparel or the Barah, rising from the Alwar hills, flows northeastward to terminate in Bharatpur district. Rising from Jaipur hills the Banganga runs through Bharatpur and Dholpur to join the Yamuna.

Climate

The region presents a transition between two major climatic regions of India, the humid east

and the arid west. It may thus be designated as semi-arid marked by extremes of temperatures and great variability and uncertainty of rainfall. According to Koppen's scheme, the region falls in Bshw i.e. warm semi-arid steppe type with mean annual temperature over 64.4°F (18°C) and an annual rainfall between 18" and 35" (45-88 cm). The extreme climatic conditions may be attributed to its inland location and vicinity to the Tropic of Cancer, lack of vegetal cover, nature of soils and bare rocks. The altitude at places modifies the temperature; Mt. Abu and Bhorat remain comparatively cooler even at the peak of the summer season and winters are severe (Fig. 13.5). The large waterbodies like the Pichola, Fatchsagar, Udaisagar, etc., also exercise moderating influence to some extent over the local climate. On the whole, winters are normally cold while summers are hot and dry. The rainy season is quite pleasant with greenery.

January is the coldest month of the year when the average temperature ranges between 10.9°C in the north to 16°C in the south, the gradient being steeper in the north. At times due to cold wave temperature reaches the freezing point with occasional frost. May and June are the hottest months, the temperatures always ranging above 30°C . While Bharatpur (39.8°C) and Kota (32.3°C) have maximum temperatures in June, the stations in the Aravalli uplands record their maximum in May. The highest recorded temperature is 43°C (Alwar), while Mt. Abu has less (31°C). The annual range of temperature lies between 18° — 20°C while the absolute annual ranges are still higher; Gwalior records 43.3°C in May and only 5°C in December with a range of 38.3°C . Diurnal ranges of temperature are also significant, being higher in winter (19°C) and lower in summer (5° in SW, and 13°C in NW). The winter diurnal extreme is associated with the cold wave while the summer range with scorching heat and 'heat waves'. The relative humidity being 28-30% in April and May at Kota and 20-21% at Gwalior, the gales of *loo* sweep through fiercely. In 1966 when the average May and June temperature was recorded at 43.7°C "two hundred lives were lost in the weeks time".

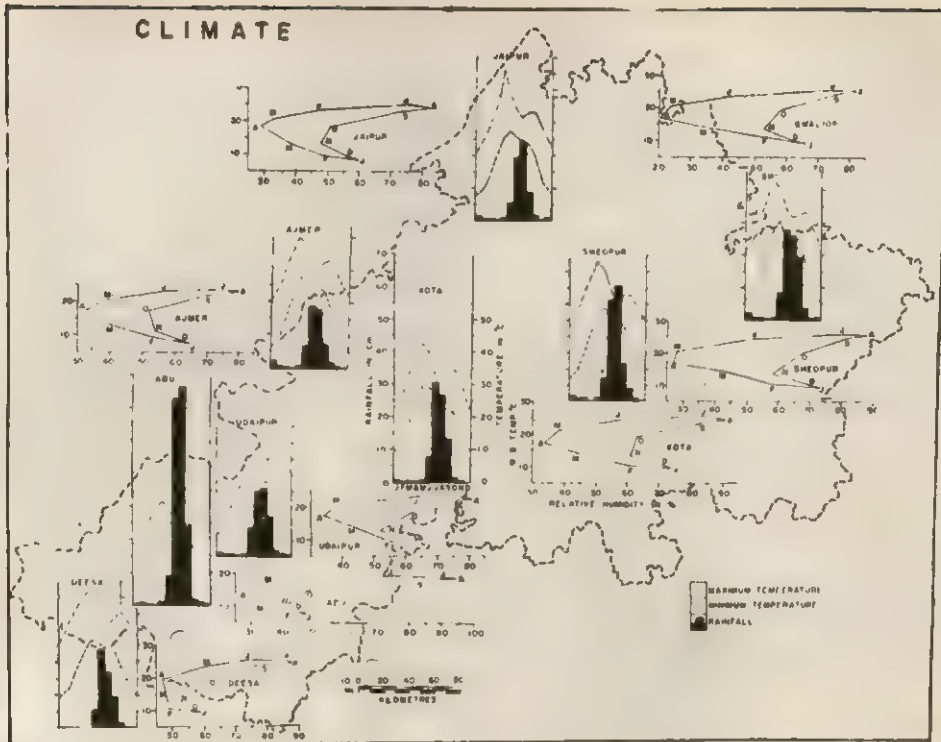


Fig. 13.5

With the onset of the monsoon, temperature begins to fall and the rise in relative humidity (79% in August at Gwalior and Kota) combined with high temperatures produces muggy or sultry conditions. By Sep.-Oct. the temperature drops to 25°C, though the retreat of the monsoon makes the temperature intolerable until it registers a fall of 5 to 7°C by November.

There are noticeable seasonal as well as regional variation in rainfall. Excepting the NW corner, over 90% of annual rainfall is concentrated within 4 Monsoon months—June-September. August is the rainiest month except in the SW part, where July maxima are noticeable, because of the early arrival of the Arabian Sea currents. Winter rains, locally known as *Mahavatti*, are associated with the western disturbances which may continue sometimes up to May. Alwar, Jaipur and Sikar receive fairly moderate proportion (10-20%) of the annual rains from

such depressions. April, of course, is the driest month.

Rainfall decreases from east and northeast to west and south west. Mt. Abu receives an exceptional rainfall (164 cm) owing to its orography having the direct onslaught* of the Arabian Sea.

Natural Vegetation

The region has a great variety of natural vegetation ranging from mixed deciduous and subtropical evergreen forests in the SE, SW and NE to scanty vegetation in the central and the north-western parts. In general, there is an increase in the intensity and variety of the trees and bush growth from N to S and from E to W, mainly corresponding with rainfall distribution. Local variations are caused by topography; growth is more luxuriant on lower slopes of the hills than near the tops, as there is less bare rock and more

soil lower down, and more moisture available. The deep and narrow valleys between the hills above the level of cultivation with veneer of alluvium and higher water table taking at times the form of springs support luxuriant forests with tall trees and dense growth of coarse grass.

Natural vegetation has been adversely affected by reckless cutting, grazing and *walra* cultivation (shifting cultivation by Bhils). At places the vegetation is not only greatly altered but indeed practically destroyed by the work of man and his animal associates, especially the goat; still some valuable forests lie intact in the more inaccessible and protected parts of the Aravalli range. Even in M. P. districts the percentage of forest cover has been much reduced below the State average (35.6%), ranging from 18.9% (Shivpuri) to 27.6% (Morena) and 21.2% (Gwalior).

Forests are mixed deciduous and sub-tropical evergreen type, with uneven distribution. It is however much more concentrated in the Abu Block, Mewar, Merwara, Bundi, Alwar hills, Gwalior, Shivpuri and Morena districts.

Mt. Abu has one of the richest forests in the region. On the higher elevations it has humid types of jungles containing *Ambartari*, stinging nettle, *Karanda*, varieties of Jasmine, weeping willow and *kara*; on the lower slopes dense forests of *dhen*, *haldu*, *bel*, *siris*, mango, *jammun*, *kachnar*, *timru* or *teleron*, *rohira* (*Tecoma undulata*) are common, interspersed with stretches of bamboo thickets.

In the Mewar hills, particularly in its southern part teak and bamboo are found in association with *dhokra*, *salar*, *gurgan*, *anwal*, *tendu*, *khair*, etc. Along the river valleys and in the lowlying areas *dhak*, *salar*, *neem*, *mehora*, mango, *jammun* and *babul* are commonly found.

Teak has also a limited distribution in the districts of Shivapuri, Gwalior and Kota. These districts along with Bundi, Morena and Bhind have also mixed deciduous trees.

Grasslands and pastures: Locally known as *beeds* pastures are extensively found in Jhunjhunu, Sikar, larger parts of Ajmer, Bhilwara and limited parts of Udaipur and Sirohi. These are also found on the hill tops and their slopes in

association with sparse trees and scrubs in Mewar, Merwara and Alwar hills. The grasses have a brief but vigorous life cycle, growing rapidly with the advent of rains, attain maximum growth during rainy months as is spayed from grazing, soon become brown and ripe after the withdrawal of rains. *Ratarda*, *Cenchrus ciliaris*, *Schima maruosus*, *Chesris barbata*, *dub*, *Iscilema laxum*, *Dichanthium annulatum*, *Chrysopason montanus*, *gumer*, *micbai*, *porwa* etc. are common grasses.

Scrubs and bushlands: Often found in association with forests and grasslands and sometimes in exclusion these represent the poorest floral type but cover a substantial portion of the region. These are found in scattered patches as well as in long stretches and generally occupy the steeper hill slopes, plateau tops and rocky denuded plains with thin soil cover or where the forests do not flourish or cultivation is out of question.

Soils

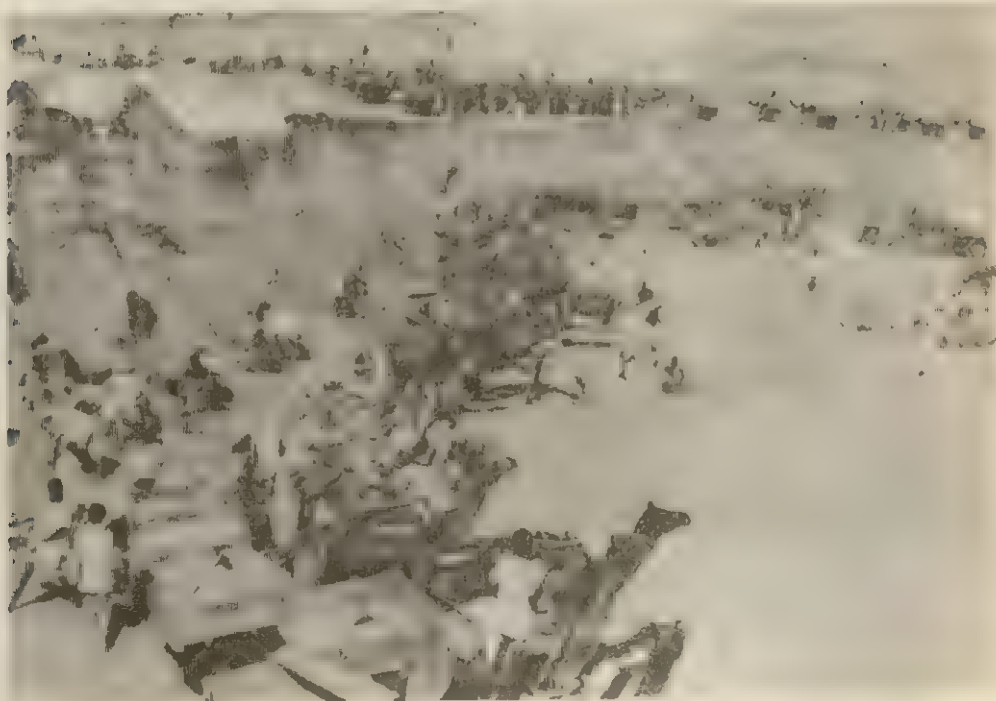
No systematic study of the regional soils is possible because they have not been surveyed on a scientific basis. However, Pendelton's soil survey in Gwalior and Shivpuri districts and soil surveys of the Chambal commanded areas in both Madhya Pradesh and Rajasthan provide us data for presenting a sketch of the regional soil types as follows:

(a) *Alluvial soils* are an important soil group of the region. They are found in the districts of Bharatpur, Sawai Madhopur, Tonk, Morena, Bhind, Gwalior, Alwar and Jaipur. They vary in texture from clayey to sandy loam and have varying tints. The A-horizon of their profile is often deficient in phosphate and calcium while its nitrogen contents vary. Because of illuviation the B-horizon is generally richer and heavier. The soils of Bhind district and parts of Morena and Gwalior are pale-brown to yellowish brown, while those in Bharatpur, Sawai Madhopur and Tonk take on a yellowish or reddish tint. In other parts the alluvial soils carry dark grey-brown or dark brown shades. Saline and alkaline patches occur where the water table is high. Locally lime concretions also occur. Generally these soils are noted for good productivity.

PLATE XI



Annasagar, Ajmer



Rajasthan Canal Construction



The Historical Jhansi Fort : the stronghold of Maharani



A view of Jhansi City from the Jhansi Fort

(b) *Medium Black soils* find their clear manifestation in the Malwa plateau lying to the south-west. These are extended into the districts of Kota, Bundi, Morena, Shivpuri and Gwalior. The soils are not very deep and occur in the forms of clays and loams of dark brown colour. Because of the general slope of the country from south to north, mixtures of black soil and alluvial soils are often found in the river valleys. The soils are usually poor in phosphates, nitrogen and organic matter, but are self-sufficient in calcium and potash. They respond well to soil management practices and give better yields.

(c) *Mixed Red and Black soils* are confined to the eastern part of Gwalior, Shivpuri, Bhilwara, Udaipur, Chittorgarh and Dungarpur districts. They are commonly light-textured and devoid of lime concretions. They occur as sandy clay or sandy loam. They are usually deficient in phosphates, nitrogen, calcium and organic matter. They differ in depth and fertility. Black clayey soils have good agricultural returns, while shallow, gravelly red soils are of poor quality.

(d) *Grey and Brown soil* is found abundantly west of the Aravalli axis in the NE, in the districts of Jhunjhunu, Sikar and Nagaur. It is also found in pockets in parts of Pali and Sirohi districts of Rajasthan and northern Banaskantha in Gujarat. It is characterized by vast stretches of sandy plain including hillocks and rock outcrops. The fertility of the soil increases towards the E and NE. It is saline and alkaline and has a high phosphate content comparable to that of alluvial soils. It is calcareous in nature. The soil fertility is enhanced due to the presence of nitrogen in the form of nitrates. The hilly areas in the south have heterogeneous distribution of soils, whereas towards the north more uniform and heavier soils are found.

(e) *Red and Yellow Soils* occur together in the western parts of the districts of Ajmer, Bhilwara and Udaipur of Rajasthan and northern Sabarkantha of Gujarat. The yellow colour is due to higher degree hydration of ferric oxide. Silty loam to silty clay loams are common but in the northern part of this area, mainly in Ajmer, it is sandy. These are poor in carbonate and humus content.

(f) *Ferruginous red soil* occupies the central and southern parts of Udaipur district and the almost whole of Dungarpur district and parts of northern Sabarkantha. It has been formed from ancient crystalline and metamorphic rocks. It greatly differs in depth and fertility in different areas. It is invariably free from *Kankar* nodules and has a porous and friable structure.

Soil Erosion : The region is suffering from an acute problem of soil erosion. Here sheet and gully erosion have assumed alarming proportions. The valleys of the Chambal and its tributaries, the Sindh and the Banganga have been badly dissected by ravines as discussed earlier in detail. The fertile agricultural tracts have been eaten up by growing tentacles of ravines and gullies and soil productivity has been adversely affected. Not only alluvial soils but also medium black soils are prone to sheet and rill erosion.

The control of soil erosion and conservation of the affected areas is a vital question for regional stability. Luckily there is a growing consciousness about the problem and governments are engaged in their control and reclamation.

Minerals

The Aravalli region possesses the most important mineral belt of Rajasthan accounting for about 75% of its total production of various minerals. Among the large varieties of minerals in the region are lead, zinc and silver ores, iron ore, copper, mica, building stones and road metals, beryl, calcite, limestone, soap-stone, manganese ore, asbestos, emeralds etc (Fig. 13-6). The present importance of this mineral producing region is largely in relation to its resources of non-ferrous minerals like lead, zinc, silver ore, copper ore and industrial mineral-mica.

Metallic minerals such as iron ore, copper, lead, zinc, beryl are available in the central ranges of the Aravallis. There are ample evidences in the shape of slag heaps strewn around and as remnants of furnaces that the region once had a glorious past as far as the metalli-ferrous mineral mining and smelting was concerned.

Iron-ore deposits are mainly located either on or east of the Aravalli range with major fields

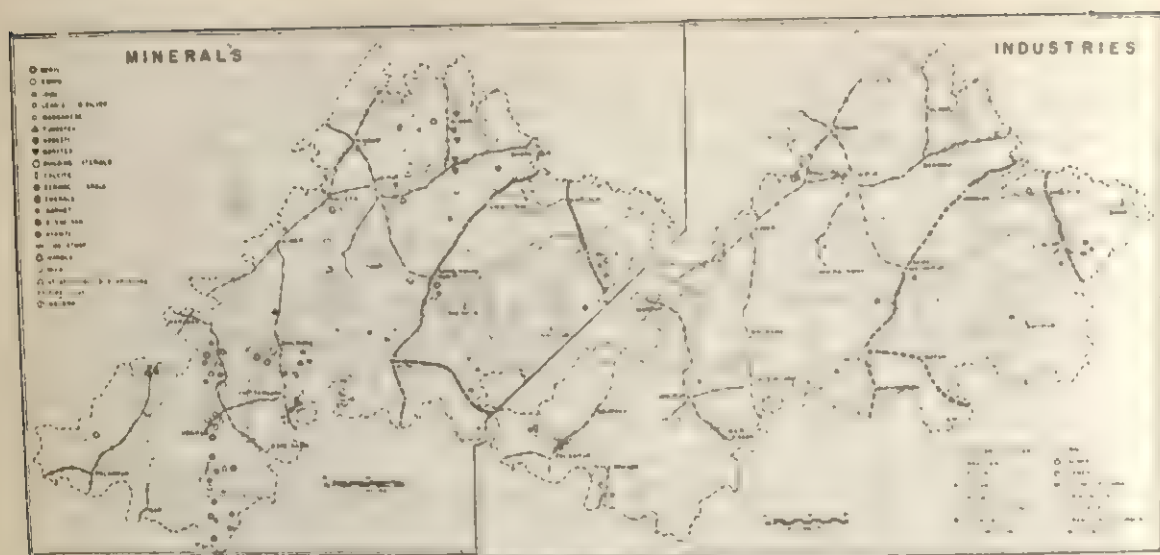


Fig. 13.6

in the northern and southern parts. In the northern part Moriya-Banol, Nimla-Raisola and Dabla-Singhana-Neem ka Thana are main areas of iron ore occurrence. In Moriya, a regular belt of 10m thickness extends for a distance of over 1 km. The ore is of haematite type with 68% metal content. About 65 km NE of Jaipur around village Nimla, scattered bodies of iron ore are found with 3 to 8 m thickness with about 67.5% metal content. In the Khetri area on the border of Haryana, inferior quality of iron ore is found (with high Phosphorus content).

The important iron ore deposits in the southern part are at Nathera-Ki-pal (61 km SE of Udaipur) and Thur-Hunder (20 km NW of Udaipur). The ore is haematite and iron content is about 58%. Scattered fields are located at Lamba (Bhilwara district) and Padarpal (Dungarpur district). Recently iron ore reserves have been traced at Loharpura and Indergarh in Bundi.

Lead and Zinc : The Aravalli region has complete monopoly over both these minerals and produces almost all the lead and zinc of India. Alongwith lead and zinc, silver also occurs, whose content is about 25.3 oz. and 5.6 oz. per ton respectively.

The distribution of lead and zinc is almost confined to the southern region. The most im-

portant deposits are situated about 40 km SE of Udaipur near village Zawar. The important working mines are located at Mochia Magra, where the output ranges between 200-300 tonnes per day. The metal content of lead and zinc is 22%; Umara and Katar (Udaipur), Mando (Dungarpur), Wardalia or Pipalkhunt (Banswara), Gudha Kishore Das (Alwar) and Chauth-ki-Barwara (Sawai Madhopur) are the other places where lead and zinc occur.

Beryl : Rajasthan ranks first in production of beryl and almost all the beryl comes from Aravalli region. Beryl is of great importance for beryllium salt and it is used for war industries as also for the production of atomic energy. It is also used in electrical and ceramic industries.

Aravalli region has several beryl producing areas but those of Amet and Kumbalgarh (Udaipur), Gujarwara and Bander Senri (Ajmer), and Deora, Jilloli, Gudha (Bhilwara) and Tonk are important.

Copper veins occur at several places but Khetri-Singhana in Jhunjhunu and Kho-Dariba in Alwar are the most important. In Khetri-Singhana area the working mines are at Kolhan and Mandhan, Khetri, Babal, Paparita and Barkhera. Kho-Dariba mines are located 48 km SW of Alwar city. Copper mining and smelting have also been

seen near Dariba (Udaipur) and Dariba (Bikaner not within the region under study)

Mica : Rajasthan is the leading producer of mica in India after Bihar. Mica leads other minerals both in production and value. Bhilwara district is the largest producer of mica in Rajasthan. The important mica mines are at Bagaur, Gorkhan, Bemali, Bhunas, Gangapur and Mankiya. The main mica bearing rock is pegmatite. From some of these mines mica has been removed up to a depth of about 60 m. Besides Bilwara, the mica belt of Malpura in Tonk and Kekri in Ajmer are also important; Barla, Makhad, Baroni, Palri, Banjari and Laxmi are other important working mines.

Asbestos : The main areas of production are located at Kherwara and Rikhabdeo in Udaipur district. In addition, other scattered areas are located near Nathdwara, Kuanthal, Asind and Sarupganj.

Barytes : Its occurrence as a commercial mineral is confined to the districts of Alwar and Bharatpur. It is found in Khora-Makrora, Bhagat-Kibas, Bhankhera-Bhurasidh, Jamroli, Sainpuri, Dholidhoop, Umeair and at Hathori (20 km from Bayana Ry. station). It has many uses in paper, plastics, linolium paints, oil cloth, chemicals etc.

Emeralds : Aravalli region of Rajasthan is the only area which produces emerald in India. Nearly all the emerald occurs in Udaipur district in a narrow belt that stretches between Deogarh in the N to Kankroli in the S along Mavali-Marwar Junction railway

Soap stone, Talc and Steatite : The Aravalli-region is rich in high grade steatite and provides almost the entire quantity (85% of India's total production). These minerals are widely distributed throughout the region but the following three areas are most important : Deopura (Udaipur), Chewaria and Chandpura (Bhilwara) and Dagotha and Jharna (Jaipur).

Limestone : Quality limestones are available in the Aravalli region at Mimbahera, Chittor, Kishangarh, Nandwas, Maonda, Raigarh, Kota, Bundi, Shivpuri and Gwalior. High grade lime from these limestones is prepared by shaft-kilns.

Kankar is burnt locally all over the region for good building lime. A polishing factory at Lamganj Mandi (Kota) turns out polished limestones and tiles.

Marble and other Building stones : Last, but not the least in importance amongst the mineral resources of the Aravalli region are its excellent building stone deposits which vary from fawn sandstone of the Vindhyan to excellent marble of Raialo series. Quartzites, flagstones and slabs are obtained from the Alwar and Ajabgarh series.

The quarries of Makrana are famous for their high grade marble—white, grey and pink. The Makrana deposits are located close to Makrana railway station in the N E of Nagaur district. The main quarries are at Chari hills, Mania-Kibhankari, Kumari Dungari, Dholi Dungari, Bhulla ridge and Kala Dungari. Makrana marble contains very little percentage of impurities compared to Italian and Grecian marble. It contains 98% calcium carbonate. In this area about 200 quarries are being worked mostly by open method. The depth of the quarries varies from 30-45m.

Other occurrences of marble are found in Maonda (Sikar), Kishangarh (Jaipur district), Jiri and Dadampeer (Alwar), Devimata and Rajnagar (Udaipur) and Bhatana (Sirohi).

Apart from these, various other minerals like calcite, clay, fluorite, Feldspar, manganese, garnet, kyanite are also found in the region. The famous Gwalior potteries use the China clays of the region. Glass sand deposits of Bundi, Sawai Madhopur and Bharatpur provide for glass factories at Dholpur and Kota.

The Physical Resource Base

The principal physical resource base of the region comprises of soils, minerals and forests. The variety of soil and adequate rainfall in southern part provides opportunities to grow diverse crops. However, extensive irrigation is imperative to stabilize the agricultural activity. The region is endowed with a vast variety of minerals. It provides almost all the metallic minerals of Rajasthan and has monopoly in the production of lead, zinc, mica, copper and iron ore in Rajasthan. It is the only region in India which produces

soap stone, beryl and emerald. The region with hilly topography is rich in building stones, slabs for roofing and other building materials. Absence of coal is a stumbling block in its industrial development. Thus, though it is a mineral-rich region yet these mineral resources have not been able to change its basic agricultural economy.

Luxuriant forest, though in pockets, concentrated in Mt. Abu, Mewar, Merwara and Alwar hills are important source of timber, fire wood, fuel coal, *Katha*, bamboos, *tendu* leaves for *bidi* and *mahuwa*. The extensive pastures particularly in Jhunjhunu, Sikar and parts of Ajmer and Bhilwara provide a base for stock-raising in this part of the region. Undoubtedly the region possesses enormous amount of potentialities and poses a challenge to human endeavour. It would be no exaggeration to predict in the present context that if the physical resources of the region could be utilized and developed more in a planned way, these might support and feed many more mouths.

The Cultural Setting

The foregoing analysis of the physical framework leads to distinguish two regions of first order, the Aravalli Uplands and the Chambal-Sindh Basin which exhibit distinct spatial patterns of cultural features. It may, therefore, be worthwhile to analyse the cultural setting by these regions separately.

Aravalli Uplands

Population

The Aravalli Region had a population of 9,490,156 persons (1961) in an area of 93,771 km² showing much higher density (101 persons per km²) than the State average (51). The most striking feature regarding distribution of population is its concentration in a few favoured pockets (Fig. 13.1). The Northern Aravalli, with its more or less level topography (except in its central part), fertile soil and facilities of irrigation has comparatively more population (43.1% population in 26.3% area); in the Central Aravalli population is concentrated in and around Jaipur and Ajmer (27.4% in 22.3% area); while the southern Aravalli region with its rugged and hilly

terrain and forest cover, has sparse and widely scattered population (29.5% population in 51.4% area). There are few patches of concentration in the districts of Dungarpur and Banswara, resulting from retreat and refuge of the *Adivasi* (Tribal) population during the early medieval period. In these districts population is also concentrated in the Mahi alluvial plain.

In Southern Aravalli even at the lower levels the density is less than the regional average : Abu Block (68), Middle Mahi Basin (82), Banas Plain (89) and Mewar Hills (81). In Central Aravalli, there exists contrast between the densities of the Merwara Hills and Malpura Tract; in the former the high density is largely due to the presence of four towns. Within the Malpura Tract, the southern part is quite sparsely populated in contrast to the northern where the presence of the city of Jaipur is one of the important factors in raising the density figure. The high density in some parts of the Alwar hills (average 123) is largely due to the presence of fertile dark clayey soil, with irrigational facilities. The Sambhar basin with its semi-desert conditions has lower density (81).

Growth of Population : The population of the Aravalli Region has shown a lower increase (23.7%) than the State (26.2%) during 1951-61. In reference to State's growth rate, only Dungarpur, Tonk and Alwar districts experienced higher growth. The highest growth took place in Dungarpur (32.0%) because of the preponderance of the *adivasi* population there. The social customs of the tribal people help in rapid growth of population. In addition, the Malwa soil and availability of water in abundance are some of the forces which have been responsible for the increase of population. Alwar and Tonk districts too have experienced higher growth largely because of the increased facilities of irrigation. It is most surprising that the district of Ajmer (19.1%) experienced lowest growth.

Urban Population : The percentage of urban population (16.22) in the Aravalli Region is slightly higher than that of the State (15.1), with very limited number of urban centres such as Jaipur, Ajmer, Udaipur, Alwar, Beawar, Sikar,

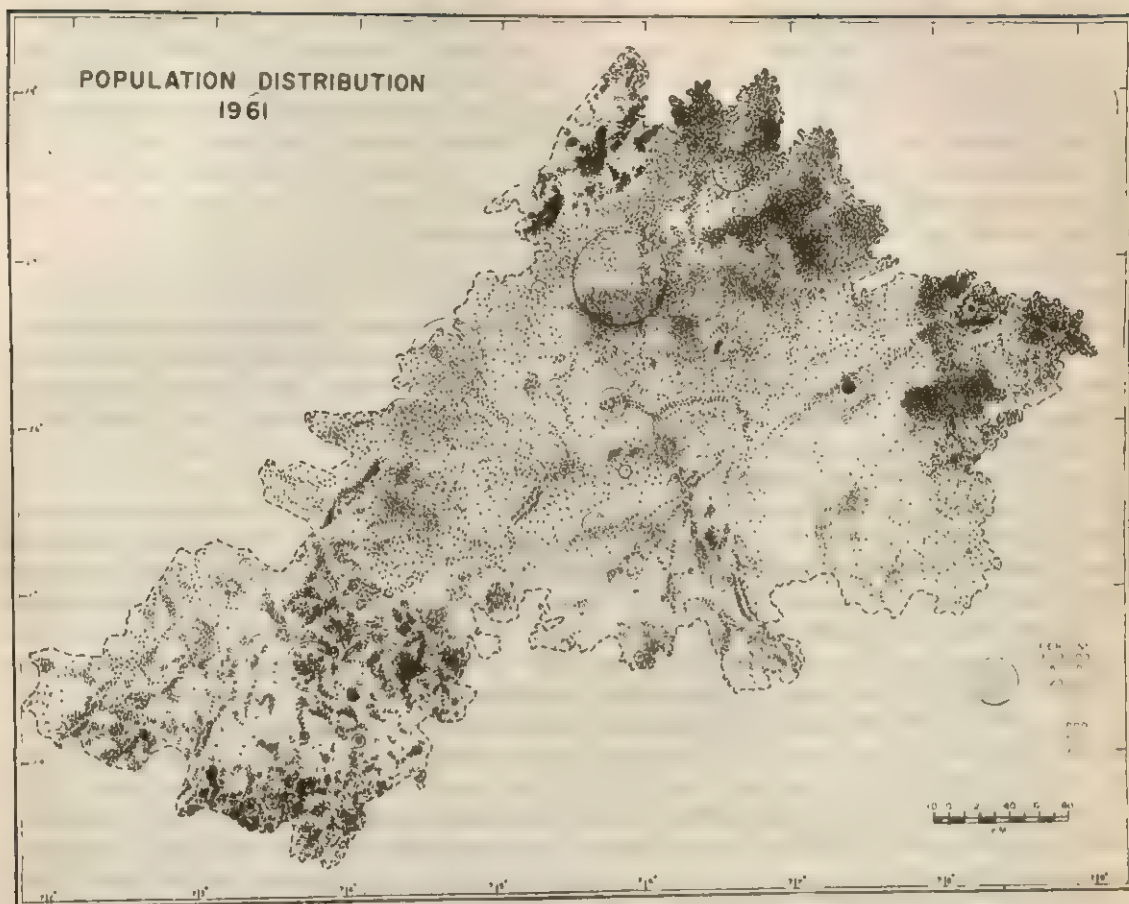


Fig. 13.7

Bhilwara and Tonk etc, of which the first three are among the six class I cities of Rajasthan. The proportion of urban population in the Central Aravalli is highest (32.1%), with Jaipur and Ajmer as the two largest cities, followed by Northern (11.0%) and Southern (9.6%). Four out of the 12 districts show less than 10% urban population : Dungarpur (5.26%), Bhilwara (8.18), Alwar (8.8) and Tonk (7.36); five districts show 10-20% urban population (Jhunjhunu, Sikar, Sirohi, Udaipur and Chittorgarh), and only two districts, Ajmer (37.44%) and Jaipur (26.26%) have more than 20% of urban population.

Occupational Structure : As compared to other regions as also to the State (47.5%), the Aravalli Uplands have somewhat higher proportion of

workers (49.2%). About 58% of the males and 39.2% of the females are workers. Likewise, 52.8% of the rural and 30.5% of the urban population comprise of workers; the variation is more pronounced in case of female working population of rural (44.76%) and urban (10.3%) areas. Percentage of female workers in rural areas is considerably high because of the preponderance of agriculture and household industries in the villages in which female labour is very common.

Although the patterns of occupational structure is diversified, yet 76.9% of the working population is engaged in agriculture. The district of Dungarpur (91.1%) has the highest percentage of workers in agriculture, followed by Chittorgarh (84.7), Jhunjhunu (83.4), Nagaur

(83.1), Bhilwara (83.0), Udaipur (81.3) and Alwar (81.1), while Sirohi has the lowest (59.8). Household industries are also significant in providing employment (6.7%).

Social Structure and Literacy : Over 94% of the population is Hindu. The percentage of scheduled castes (14.2) and scheduled tribes (16.8) is considerable in the region. Sirohi district (19.1) has the highest percentage of scheduled castes while Tonk (3.9%) the lowest. Similarly, Banswara, though out of the area, (71.5%) has the highest percentage of scheduled tribes and Nagaur (0.2%) the lowest. It would be observed that the northern districts of the region have higher percentage of scheduled castes, while there is preponderance of scheduled tribes in the southern districts. The hilly and forested districts which are in the south have always acted as areas of retreat for the *adivasis*, who are predominantly Bhils.

The percentage of literacy (15.5) is slightly higher in the Aravalli Region than that of the State (15.2%). The percentage of male literacy is 24.2, while that of female is only 6.2; similarly the percentage of urban literacy is 39.9 and that of rural is 10.8.

Like the State, the region is by and large Hindi speaking with several local dialects—Mewari, Marwari, Dhundhari, etc.

Sex-Ratio : It would be observed that the regional sex-ratio is 923, 932 and 879 with respect to the total, rural and urban population of the region respectively. The urban sex-ratio of the State as well as the region is higher than that of India. This may be ascribed to the fact that the urban population in the State or the region, with a traditional livelihood structure is family-based.

Dungarpur has the highest sex ratio—total (991) as well as rural (995). This is partly due to social customs such as polygamy and early marriage among the Bhils. The total sex ratio is lowest in the district of Tonk (887), while in Alwar the rural sex ratio is the lowest (896). Urban sex ratio is highest in Sikar (949) followed by Jhunjhunu (944). This may be ascribed to the out-migration of male population into the different parts of India in connection with busi-

ness and industries. Out of 13 districts of the region only 5 comprising of the districts of Tonk (887), Jaipur (890), Alwar (892), Bhilwara (906) and Ajmer (913) have lesser number of females per thousand males than the average of the region. It may be generally observed that the southern districts of the region have more females per thousand males.

Population as a Resource-base

The resources could not be more fully developed because of lack of resource consciousness among its people. However, after independence, great efforts are being made to make scientific and fuller use of available resources both at the public as well as private levels.

The future prospects of the development of the region are enhanced with the availability of diversified and some rare mineral wealth, bountiful forests, rivers and at places good soil and irrigation facilities, and above all the man with his knowledge and will to develop the region. The business communities of the region, who have developed the industries of the whole of the country are now turning their attention to develop their home region commercially and industrially. There are better prospects of agro-forest and mineral-based industries in the region. Some of the more skilled and industrious agricultural castes like the Jats, Ahirs, Malis, Dangis, Patels etc., are present in the region who have utilised the land as best as they could under a certain situation but the pace of utilization is on the increase because of improved situation. The human resource is manifested in another way. The region (especially north) has some castes like the Jats, Ahirs, Rajputs, Kayamkhanis, etc., who have made their mark in the Indian army as some of the best combatants. The *adivasi* population or *vanputras* as they are called, abounding in the southern region can be prepared to utilize the forest resources of the region in a more organised and scientific manner. Thus the prosperity of the Aravalli Region is not only linked with its physical resources but also with the abundant and varied human resources which ultimately are its people.

Rural Settlements

Settlements of the Aravalli region characteristically are rural in nature since over 83% of the total population lives here in about 16,000 villages, varying in size from scattered habitations of a few huts to compact settlement of even more than a thousand households. About 70% of the villages have population below 500 persons and only 3% between 2,000—10,000 while there is not a single village of over 10,000 population.

The density of villages varies from 8.0 in Sirohi district to 28 per 100 km² in Banswara. There are specially two belts, (i) the southeastern Mewar including parts of the districts of Udaipur, Chittorgarh and Dungarpur, and (ii) the north-eastern region including parts of Alwar and Jaipur, which represent high density of villages (25 and above, per 100 km²), while rest of the areas lying mostly towards the western sector and in between these two aforesaid zones show lower density of villages (15 per 100 Km²). This is perhaps because of the fact that areas of higher village-densities have relatively smaller size of settlements (mostly below 500 persons) and the areas with lower village densities have mostly medium-size villages (500-2,000). The middle Mahi Basin comprising largely the district of Banswara, and some parts of the Malpura tract including the southern part of Jaipur, are the areas of highest village density (above 30), because of very high percentage (i. e. above 80) of rural settlements of the smallest size group (below 500). The proliferation of tiny villages has been possible here largely because of fertile black-Malwa soil of Kushalgarh, Bagidora and Banswara tahsils and loamy soil of Dudu, Phagi, Chaksu, Sanganer, Lalsot and Dausa tahsils of Jaipur.

Physical factors in combination with a set of cultural factors like irrigational and agricultural practice, land tenure and distribution of holdings, and more particularly culture-contacts and agricultural, the presence of communities such as Ahirs, Jats and Meos of the Sabi Basin and Alwar plain as traditionally skilled agriculturalists are to a large extent responsible for controlling higher rural densities. The high percentages of irriga-

ted and cultivated lands in Bassi, Ramgarh, Dausa, Lalsot and Sikri tahsils of Jaipur and Thana Gazi and Rajgarh tahsils of Alwar are responsible for high density of rural settlements in these areas.²¹ The density of rural settlements, on the other hand, is low where the arable land is dissected. The main Aravalli axis where neither conditions are favourable for systematic irrigation nor cultivation is extensive, villages are not only less numerous but are also very small in size and distributed along the rivulets in form of 'phals' (hamlets) comprising a few huts. The southern part of Udaipur district, and especially the area locally known as *Bhomat*, has developed typical Bhil settlements. The Bhils who have taken to permanent cultivation very recently, used to practise *walra* consisting of small fields created out of shifting practice. Now, they have transferred their *walra* fields to permanent cultivation but their small fields continue to persist giving rise to a number of scattered or hamleted rural settlements. The smallness of size and high density of rural settlements may be partly explained by improvised means of irrigation and nature of Bhil holdings. They have tiny patches of land which they prepare out of stony soil by toiling and fighting hard with the local hilly terrain. They dam small streams here and there to water their fields and prefer to live near them so that maximum attention and time may be devoted to get at least a subsistence or handful of return. Here, the scattered manner of grouping seems to have evolved largely because of dissection of relief, soil and hydrography which consequently has divided the limits of cultivation itself.

Types of Rural settlements: Generally, three types of rural settlement may be recognised here, compact, dispersed and several intermediate types. (Fig 13.8).

Compact settlements are distributed largely in the northern and central parts of the region including parts of Jhunjhunu and Sikar districts, Alwar hills, Merwara hills, Western Sirohi and small enclosed basins within the Mewar Aravalli. The hills of the region have afforded suitable sites for strong-point feudal villages. These villages are preferably located either at the foot

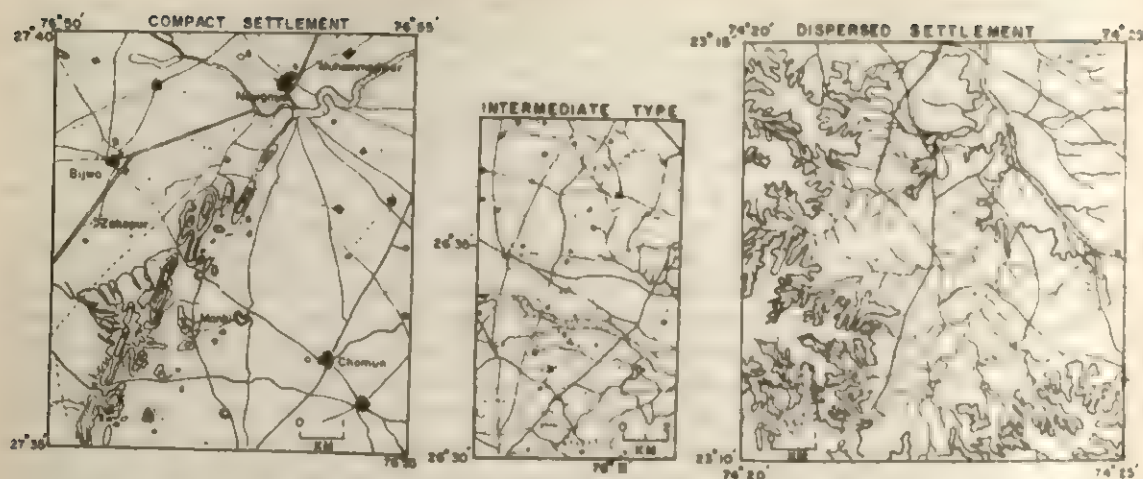


Fig. 13.8

of some hills, or grouped around forts on hill-tops for security from attacks and internecine feuds. The hill-enclosed basins especially of Mewar where, speaking relatively, the proportion of superior soil is higher and the dark clayey loam is periodically renewed by the alluvium washed down from the surrounding hills, are occupied by small or semi-compact settlements. Compact settlements in parts of the semi-arid districts of Jhunjhunu and Sikar and western part of Sirohi in the south are governed by scanty and uncertain rainfall, sand-dunes and low water-table. It is under such geographical conditions that the water-seeking settlements in these areas have occupied low-lying areas with a calcareous substratum suitable for the construction of wells and tanks.

Throughout the hilly tract of Aravalli region huts are widely dispersed over the revenue village lands. In the dissected hills of Mewar, Marwar and Alwar isolated farmsteads are dotted in the long narrow valleys. The Middle Mahi Basin including Banswara district and eastern part of Dungarpur have also rather uniformly scattered habitations amidst the cultivated lands. The Aravalli hills, especially in the southern Mewar are conspicuously occupied by forests. The dispersal is characteristic of the wooded Aravalli hills in southern Mewar where huts are scattered at a distance of 50 to 100 m. Some of the forest-settlements are even temporary or periodic in

nature and shift in their sites occurs after collecting the products. The dispersal of settlements is also associated in southern Mewar with the Adivasis (the Bhils). Even after the abolition of the 'jagirs' the Bhil settlements are clinging to pieces of land allotted to them all around the village of the former *Bhumiyar* or jagirdar.

The intermediate type includes many variations like hamleted, cluster-hamlet and semi-clustered settlements. This type is the rule of the riverain tracts of new alluvium occupying the high-level plains of the Khari, Banas, Berach, Kothari and their small tributaries. Here the strips of the valleys run parallel to the streams approximately from south-west to north-east within Bhilwara and Chittorgarh districts and also Rajsamand, Mavali and Vallabh Nagar tahsils of Udaipur. Here towards the east the hilly region becomes open for piedmont plain tracts of big dimensions interspersed with valleys covered by thick alluvium, the dissection of which at some places has given rise to bad lands. Under such physical conditions, the open high-level plain is strewn with hamlets, while the valley itself is occupied by clustered hamlets, preferably selecting the areas free from flood and bad lands.

Nai Village (24°33' N and 73°38' E; 1961 population 2,558) is situated 8 km south-west of Udaipur city on the Sisarma river flowing between two parallel ridges of about 300 m. The village was

established by the Rajputs in view of the fertile and level area along the valley, found on its south-west. The village consists of over 400 houses grouped around the village temple and shared by Rajputs, Brahmans, Mahajans and Bhils, the Bhils being numerically the largest group; each caste lives in a compact block. Bhils live in the NW corner of the village away from the higher castes. Meghwals and Gadrís (Gaderia) are concentrated in the NE and western side of the village. Kumhar, Kalal and other castes are scattered all over the village. The size of the house and number of rooms vary with caste and economic status; the Bhils have mostly one room house, while the Mahajans and Rajputs have five to ten room houses. The Meghwal houses have one *chauk* and open verandah attached to the room, the verandah serving for their working on leather. Stone is the usual building material

and red clay, the cementing material. About one fourth of the total land is cultivated and main crops are maize, wheat and barley. Wells are the chief means of irrigation.

Dorai Village ($26^{\circ}23'N$ and $74^{\circ}38'E$; 1961 population 1,608; area 2,713 acres), situated about 10 km south of Ajmer, derives its name from Moghul prince, Dara Shikoh. It is a multi-caste agricultural village inhabited by Mahajans who are economically dominant and are centrally located and about two dozen other agricultural, artisan and labour castes and Muslims (Fig. 13.9). Most of the castes live in compact blocks and Muslims are in the NE; Rengar, Deswali, Mali and Kasai (butcher) are numerically the most important. The village has almost trebled in size since 1921 (Pop. 595). Over 85% of the total land is cultivated and bajra, wheat and maize are the chief crops. Wells, tanks and a few tube-wells are the means of irri-

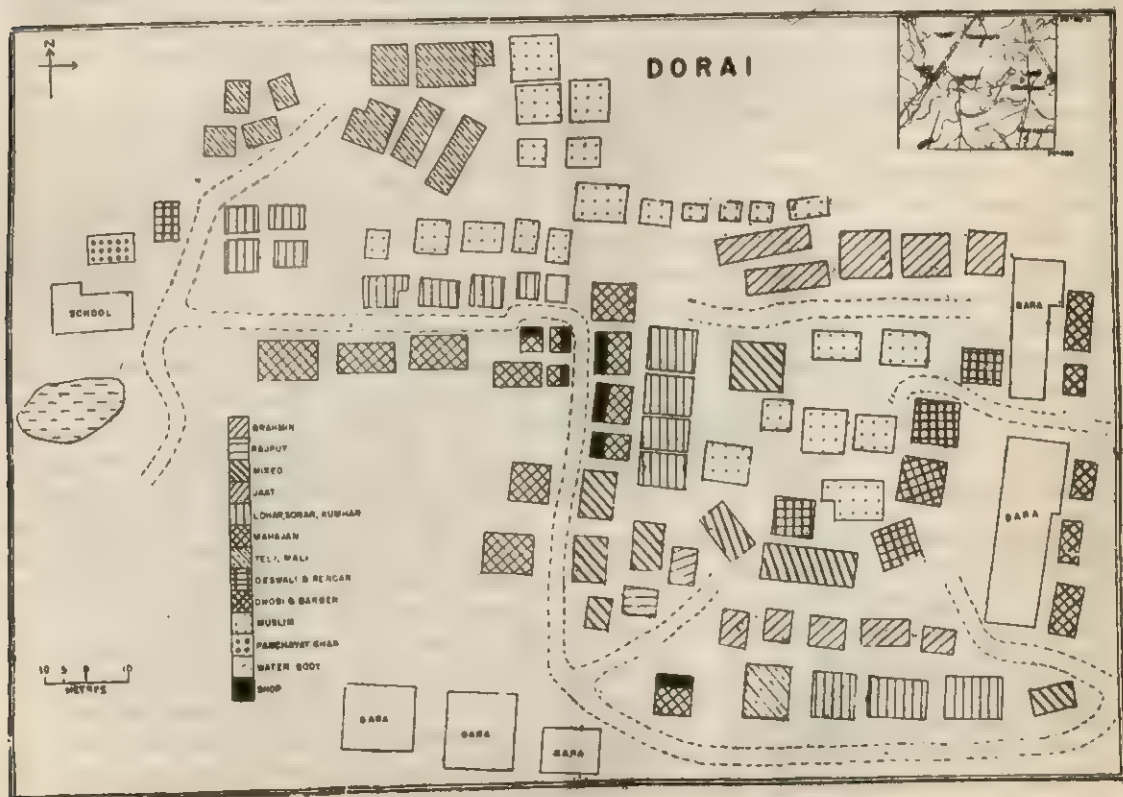


Fig. 13.9

gation and farmers have also now responded to HYV seeds and other improved techniques of farming. The farmers also keep livestock which number about 1,600 over half of which are cattle and rest are goats and sheep. Built-up area is covered by about 300 houses, two-thirds of which are pucca, and over half are double storeyed. For protection from heat, the walls are kept thick and doors are opposite the wind direction for safety from *Loo* and hot dusty winds.

Rural Service Centres : The historico-political patterning of the region is mainly responsible for the lop-sided development of central places. In rural areas these are irregularly distributed along routes linking them with larger centres.

In Phalasia tahsil of Udaipur, *Jhadol* is developed as a typical rural service centre in the Manas valley nearly 48 Km southwest of Udaipur. The rural centre is connected by unmetalled roads nearly from all sides and it forms nucleus for the surrounding area of approximately 25 km radius. The settlement with its market is developed almost in a linear pattern along the main road. The centre is occupied by a small fortress flanked by a market having at present nearly 50 shops of kirana (30), cloth (3), goldsmith (3), tailors (2), teastalls (5) and of other miscellaneous nature. Rajput, Mahajan and Brahman form the main caste-groups of the village. The total population at present is nearly 1,300 and about 50% of the people are businessmen, while the rest belong to service-class and agriculture. Patels and Rajputs form the main agricultural castes. Jhadol provides administrative, commercial and marketing, educational or medical services to people of Kotara and Phalasia tahsils.

Urban Settlements

There are, in all, 66 urban centres in the Region including 8 towns of Gujarat areas. Apart from 3 class I cities (Jaipur, Ajmer and Udaipur) there are 3 class II cities—Alwar (72.7 thousand), Beawar (53.9 thousand) and Sikar (50.6 thousand), and 4 Class III towns—Nawalgarh (24.9 thousand), Nasirabad (24.1 thousand), Kishangarh (25.2 thousand) and Bhilwara (43.4 thousand).

Jaipur (10) and Ajmer (8) are the leading districts in terms of number of the urban settlements.

Kekri, Sarwar, Bijainagar, Beawar and Kishangarh in Ajmer district, and Dausa, Chomu, Sambhar and Chaksu in Jaipur district are important agricultural *mandis* or centres of commerce and industry in the Aravalli region. Some of the towns have attained the urban status because of their specialised functions such as Phulera and Bandikui as railway, Nasirabad as cantonment, Pushkar as religious and Jobner as Agricultural University centres. Udaipur and Chittorgarh districts come next and each of them has 6 urban settlements which, like every where in Rajasthan, have been largely *thikanas* of local chiefs (centres of princely states). At present, Chittorgarh and Udaipur have become centres of growing industries like zinc-smelting, cement, sugar etc. Nathdwara is an exclusively religious centre and Nimbahera is well-known for stone-quarrying. Rest of the towns too either are centres for some specialised functions like mining, industry, religion, health-resort, etc., or growing *mandi*.

Most of the towns in the Aravalli region have developed as *point de appui* and possess nevertheless positive sites in terms of their original function as capitals of princely states, but have been at disadvantages when judged in terms of contacts and communications with the outside world. It is only very recently or perhaps with the coming of the railway that the towns of this part could develop relations externally.

Most of the towns of the Aravalli region are connected with the medieval period of Indian history and are invariably walled towns. Being the State capitals their fortification had been a common feature and many of them like Ajmer, Udaipur, Jaipur, Alwar, etc., were enclosed by a formidable wall. The seats of hundreds of local chiefs of the pre-independence time, howsoever small they might be, were generally walled, and in some cases, moated also, defining and symbolising the town, more or less, as an island where its gates were locked at sun down.²² It is actually the means and modes of the contemporary warfares that have given rise to numerous walled settlements including rural centres, distributed widely in this historic region of great saga.

The nature of the site has affected the built-up area of many towns and in most cases the settlements occupy higher ground—may be a mound or ridge flanked by a water-body or a high bank of a river, the foothill, the hill-girdled basin, etc. The streets follow gradual slopes along the contours and the original plan of the town seems adjusted generally to the direction and position of the main routes governed by gates in the wall which itself is adjusted to the relief. The town-plan also displays closer adjustments to the central market place which is generally found either beside the traditional temple of some deity or adjoining the palaces at the foot of a fort. Majority of the towns here are characterised by politico-cultural functions and their pronounced sites including their town-plans exhibit lines of natural defences occupied by ditch, lakes or tanks, for-

trass, palace, temples, and fortified walls and gates.

Udaipur ($24^{\circ}35' N$ and $72^{\circ}43' E$; 1961 Pop.111, 138)²³ lies on the eastern flanks of the Aravalli Mountains in South Rajasthan overlooking the Ahar valley, with Fatehsagar and Pichola lakes exerting a moderating influence on climate, enjoying a unique and picturesque site. It is well-connected by air with Delhi, Agra, Jaipur and Ahmedabad.

The town was founded by Maharana Udai Singh in A. D. 1559 and continued to be the capital of Mewar state till its merger in the Indian Union (1949) and now it is a district headquarters and regional centre in Southern Aravalli region. Being a walled capital city, the Maharana's palaces became the political as well as administrative nucleus and as such the-building activities of the

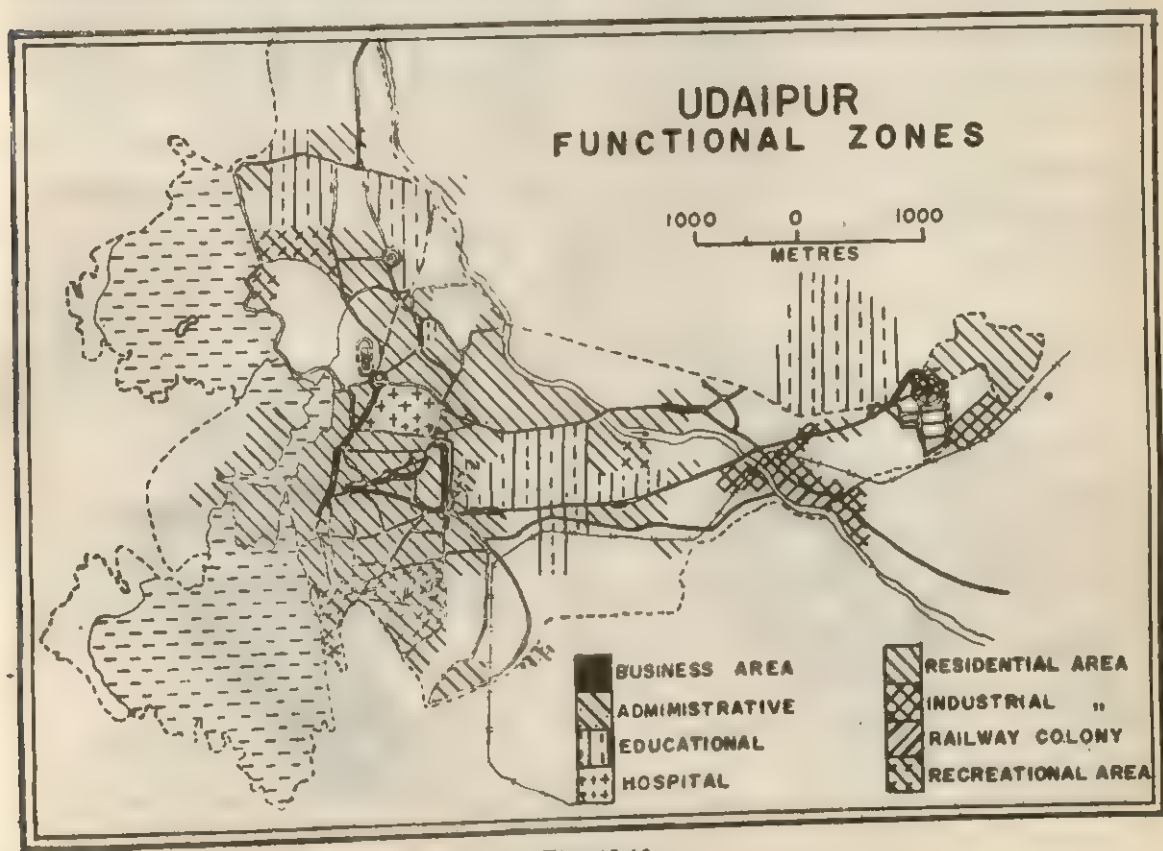


Fig. 13.10

town were confined around the palace. It was in the 17th century that the ribbon development took place along the main roads of clock tower-Hathiapole and clock tower-Surajpole roads and by the 18th century the open spaces around the major roads and lanes were fully built up. The expansion beyond the city walls, particularly along the Hathiapole—Chetak circle road, took place in the 19th century. The spectacular growth including industrial activities led to the outer sprawl in the present century.

The early layout of the city within the wall was guided by the undulating area with three north-south hillocks on the eastern shore of the Pichola lake. The railways and vehicular traffic encouraged the establishment of large scale industrial units and other urban functions causing unprecedented growth in different directions. The main business activities are concentrated in the inner zone within the wall and the modern planned shopping centres along its eastern and northern periphery, known as Bapu Bazar and Chetak circle. The outer zone comprises good residential

area and educational institutions (Fig 13.10). It has now become an important tourist resort and the Lake Palace is functioning as a modern hotel. Recently established Udaipur University has a spacious campus between Suraj, Pole and the Ahar river.

Jaipur city (26°55' N and 75°50' E; 1961 pop. 403,404),²¹ variously described as the pink city of India, the Paris of India and a Dream in Stone, is the capital and largest city of Rajasthan. It is an example of a well-planned city during princely rule amidst picturesque surroundings (Fig. 13.11). The eastern site of Amber being narrow and vulnerable was abandoned and Sawai Jai Singh II planned the present city in 1727 on the triangular plain south of lake Mansarovar surrounded by fort-crowned hills on three sides. The city is laid out after the Checker-board plan of the ancient Mansar Shilpa Shashtra within a wall with the magnificent edifices exhibiting Hindu architecture of excellence hued in pink. Being a nodal point in the Central Aravallis, the city has emerged not only as a capital city but also as a centre of vi-

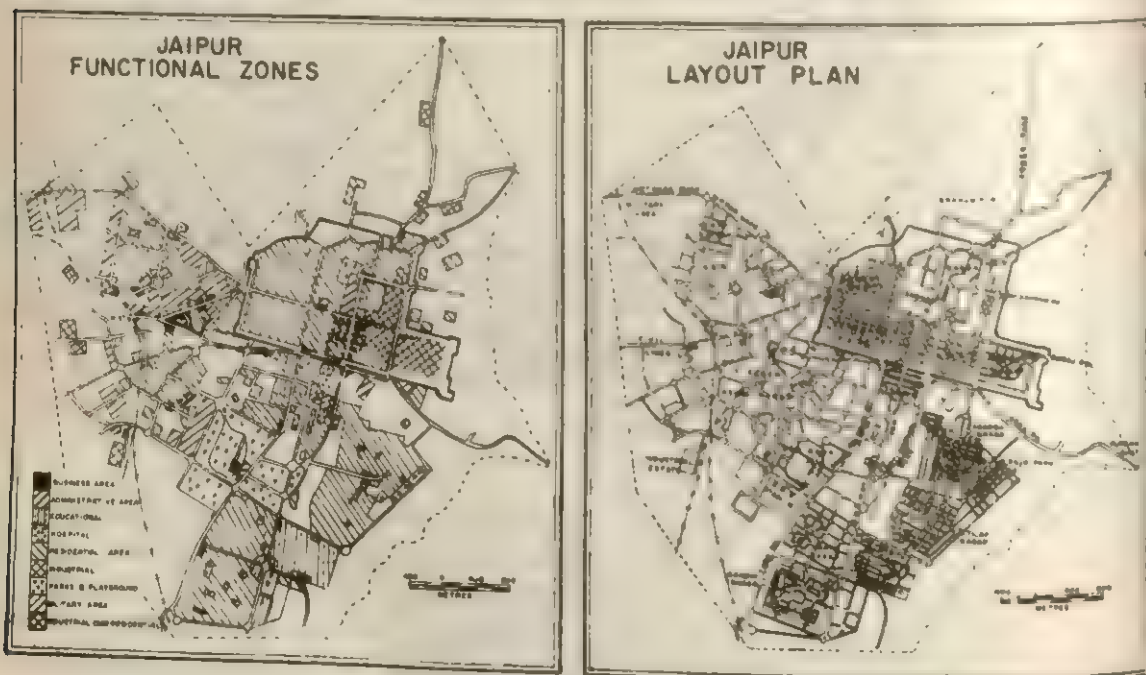


Fig. 13.11

gorous commercial, industrial and educational activity. The main business activity is concentrated in Johri Bazar, Tripolia and Chandpol with residential areas all around within the wall. Outside the wall also new, well-planned residential colonies and the University campus have emerged. The residential area covers 28% of the total land and 48% of the developed area, while commercial land uses 4.2% of the total and 7% of the developed area. Industries are concentrated in the outer areas, i.e., the Jhot Wara road, and covers 9.4% of the total and 16% of the developed land.

Agriculture

The agricultural land is locally known by various names in the different parts viz. *Nala*, *Nalcha*, *Magra*, etc., and the other flat and hilly areas as *Mal*, *Uparmal*, *Dhari*, *Tal*, etc. Aravalli

pediments and eastern flat plateaus as well as the high level plains of this region provide the basis for varied rural landuse.

Though 78% of the people of the Aravalli region are engaged in agriculture yet this primary source of livelihood is qualitatively much less developed. This is largely because of uneven and rugged terrain, sandy-stony soils, uncertain meteorological conditions, aggravated by lack of adequate facilities of irrigation and the outdated methods of agriculture.

The agricultural year is divided into two main seasons, locally called, *Sialu* (Kharif), cultivating maize, millets, Jowar-bajra, rice, pulses, oilseeds, cotton, groundnut, sugarcane, tobacco etc., covering nearly 60% of the total cultivated area of the region and *Unalu* (Rabi), growing wheat, barley, Kadma, gram, oilseeds and many root crops.

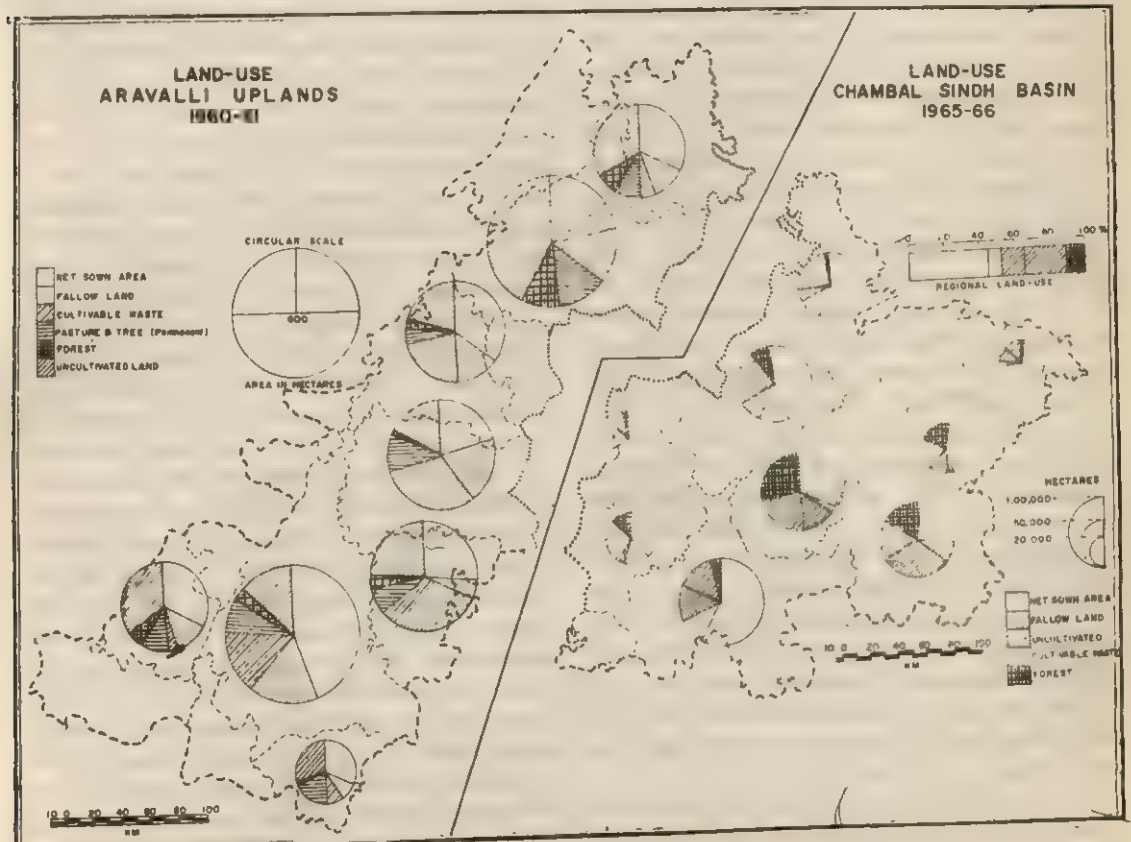


Fig. 13.12

About 42% of the total area is net sown, 3.5% under forests and nearly one-third is cultivable waste including the fallows (Table 1 and Fig. 13.12).

TABLE 2

Landuse of the Region (1960-61)

Types of landuse	Total Area in Acres	Percent
1. Forests	1,022,000	3.5
2. Not-cultivable : Non - Agricultural and Barren lands	5,991,000	20.4
3. Cultivable exclud- ing fallow land	6,232,000	21.2
4. Fallow land	3,751,000	12.8
5. Net Area sown	12,332,000	42.1
Total	29,328,000	100

Cereals cover over 71% of the cropped area followed by pulses (20.5%), oilseeds (5.6) and miscellaneous crops (2.8) like sugarcane, tobacco, cotton, chillies, potatoes and sunhemp. Among cereals, bajra occupies 31.5%, followed by jowar (16.9), maize (13.5), small millets (10.9), wheat (10.8) and barley (8.01), while only 2.1% of the total cropped area is under rice. The kharif pulses such as moong, moth, urd, chawala etc. account for 57.5% of the total land under pulses and the rest are rabi pulses (gram etc.). Among the pulses, gram is easily the most important crop occupying 41.1% of the total. Tur (Arhar), which is sown with the Kharif crops and harvested with the rabi crops, covers only 1.3% of the total area under pulses. Areally sesamum (46%) is the most important amongst oilseeds followed by rape (30%) and mustard (21%), groundnut and linseed. Amongst the miscellaneous crops cotton is most important, followed by sugarcane, chillies, etc. Potato is a newly introduced crop with small acreage. The cotton cultivation is confined to the eastern parts of Central and Southern Aravalli, adjoining the black soil area of Malwa.

As in acreage so also in production, the cereals stand highest accounting for 63.8% of the total crop production followed by cash crops 21.6%

and pulses 11.8%. The oilseeds claim only 2.8% of the total production, Alwar being the main producer (45% of rape and mustard). In the production of the cereals, maize which is the staple crop of the Southern Aravalli occupies a cove-table position, showing 28.4% of the total production, followed by wheat 22.4%, barley 21.7% and bajra 17.3%. Gram alone shares more than 2/3 of pulse production, Alwar, Jaipur and Tonk districts being the most important producers. In Southern and Central Aravalli sugarcane is a leading crop claiming 82.3% of the region's production.

The indigenous farmers of this part of the country and more particularly in the hills and other remote areas, are using the same age-old and indigenous methods and implements. But in the Mal and other plain areas as well as on the urban fringes, the change is apparent. The rural-urban fringe lands of towns and cities of Bhilwara, Udaipur, Ajmer, Jaipur and others have experienced green revolution in real sense where farming is being done with the help of improved implements including mechanisation, manures and modern methods of cultivation. These farmers are getting all types of technical advice, aid and cooperation from various governmental and non-governmental agencies. The region, for example, is employing about 3,000 tractors.

The agro-industrial units located at Jaipur, Dungarpur, Udaipur etc., are engaged in the manufacturing of various types of improved implements. Pesticides and other pest-controlling chemicals are being similarly manufactured at Udaipur to improve agricultural efficiency.

Crop-Combination Regions : Crop-combination shows marked variation in this region, not only because of physical variability but also in landuse patterns. The inter-regional differences have become more pronounced comparatively recently, because of modernisation of agriculture, however slow it may be. The following crop combination-regions of the first order may be recognised.²⁵

Bajra Region comprises of the arid and semi-arid areas of districts of Jhunjhunu and Sikar with less than 35 cm of rain, coarse and sandy soils and meagre facilities of irrigation.

Gram-Bajra-Wheat Region comprises of the districts of Alwar and Jaipur with 45-50 cm of annual rainfall and alluvial soils; while bajra is the principal kharif crop followed by jowar, gram is a rabi crop. Wheat alongwith mustard is becoming increasingly important because of irrigation facilities. Barley is also grown.

Jowar-Wheat-Gram Region : In the more rainy Malpura tract (50-55 cm) comprising parts of Jaipur and Tonk districts with medium black soils and better irrigation facilities, jowar occupies a major area of the crop land, followed by wheat and gram. Barley and maize are also grown.

Maize-Wheat-Gram Region : The southern Aravalli Region comprising the districts of Bhilwara, Udaipur, Chittorgarh and Dungarpur with moderately good rainfall, red loamy to black soils towards east and irrigational facilities, produces maize as the principal crop contributing nearly 20-37% of the total cropped area, followed by wheat and gram, while Bhilwara and Chittorgarh districts also produce jowar, cotton and barley; whereas Dungarpur district has rice as an important subsidiary crop, occupying nearly one-sixth of the total cropped area. Cotton and sesamum too have their place in the combination.

Jowar-Maize-Wheat-Gram Region : In the central Aravalli, especially the Merwara Hills (Ajmer), the major crop is jowar followed by maize, wheat and gram. Bajra is grown in drier west and wheat on irrigated land towards east. Sesamum is also produced in this region.

Small Millets-Bajra-Wheat-Sesamum-Maize Region covers the Abu Block (Sirohi). It is transitional in crop pattern. Bajra and sesamum are notable crops. In areas of better rains, maize and wheat are cultivated. The Gujarati cultivators have introduced small-millets in this region.

Industrial Economy

Industrialization in the Aravalli region is a recent phenomenon. Prior to independence, due to limited technical know-how, lack of transport facilities and the introvert policy of the rulers of this area, the resources could not be utilized for the development of modern industries. The

pace of industrial development remained extremely slow even during the first Five Year Plan, and the industrial sector of Rajasthan contributed only 1.4% to the national income (1960-61) as compared to Maharashtra (20.3%). The reason for this low manufacturing output in Rajasthan, like some other States, is ascribed to heavy dependence on household industries which employ 65.2% of the total industrial workers of the State (1960-61).

Within the region itself the northern parts comprising the districts of Ajmer (15.4%), Jaipur (12.9), and neighbouring areas are industrially more developed as revealed by the percentage of industrial workers than the southern parts, particularly those in the extreme south such as the districts of Udaipur (8.3) and Dungarpur (6.6) of Rajasthan and the districts of Sabarkantha (6.2) of Gujarat. This is also exhibited by the distribution of registered industrial establishments: Out of 312 such units (550 in Rajasthan) in the region Ajmer has over one-third (106), followed by Jaipur (97), while Bhilwara (41), Udaipur (23) and Dungarpur (1) show little development.

The reasons for such intra-regional imbalance in industrial development are obvious. Whereas the northern part is more open, close to the more developed parts of northern India, with better facilities of transport, higher densities of population and consequently more potent consumers' market and availability of raw materials, the southern part with hilly and forested terrain and limited facilities of transportation is more isolated, less densely populated, adversely affecting the consumers' market and lack of developed raw materials of mineral origin.

Some large-scale and small-scale industries came to be established only with the implementation of the Second Five Year Plan. During this period, two cement factories one each at Chittorgarh and Neem-Ka-Thana, one Railway workshop at Jaipur, two textile mills and the extension of the existing cotton mills were undertaken. In addition, Industrial Estates were established at Jaipur, Bhilwara and Makhapura (Ajmer).

The Third Five Year Plan envisaged the setting of large-scale industries like copper smelter at

Khetri, zinc smelter at Udaipur, sodium sulphate industry at Sambhar and more than 1,000 other small-scale industrial establishments.

The principal industries developed in this area are based on agricultural raw-materials, minerals, forests and livestock. On the basis of their distribution (Fig. 13.6) at least five areas having some sort of concentration of industries can be pointed out : (a) Khetri-Jaipur area; (b) Makrana-Beawar area; (c) Bhilwara-Chittorgarh area; (d) Udaipur area; and (e) Alwar area.

(a) *Khetri-Jaipur area* consists of Khetri, Neem-Ka-Thana, Sri Madhopur, Amber and Jaipur tahsils and had on an average 18.12% industrial workers to total workers in 1961. Jaipur, which employs 26.5% industrial workers, possesses engineering and electrical establishments, besides a number of other factories. Khetri is well known for its copper smelter which might initiate production of engineering and electrical goods in near future.

(b) *Makrana-Beawar area* comprises of Parbatsar tahsil of Nagaur, Kishangarh, Ajmer and Beawar tahsils of Ajmer and the part of Sambhar lake area of Phulera tahsil of Jaipur. It had on an average 17.94% industrial workers to total workers in 1961. Beawar tahsil with 27.8% industrial workers holds the most important position in the field of industries in the whole of the Aravalli region along with the town of Beawar itself where 45.4% of the workers are reported as industrial. Other towns in the Makrana-Beawar area having a comparable percentage of industrial workers are Makrana (42.2%), Sambhar (32.9%), Kuchaman (29.2%), Kishangarh (21.3%) and Ajmer (13.5%). The northern half of this area is engaged in non-metallic and chemical industries, viz., salt manufacturing at Sambhar and Parbatsar; Soda ash at Sambhar and marble at Makrana; whereas the southern half of the area is mainly engaged in cotton textile manufacturing and secondly in metallurgical industries including railway workshops.

(c) *Bhilwara-Chittorgarh area* : These two are present in the form of small pockets along Ajmer-Khandwa Western railway line. Bhilwara and Chittorgarh tahsils have only 15.2% and 13.0%

of the total workers respectively in industries (1961). The town of Bhilwara employing 23.8% industrial workers has become an industrial node with two cotton textile mills, one *ranaspati* manufacturing unit, one mica-insulating brick manufacturing unit and a number of saw-mills, dal mills and other factories. The town of Chittorgarh employs 22.5% workers in industries. Chittorgarh has recently started manufacturing cement (in 1967) and the black sandstone is quarried at Chanderi, 12 km north of Chittorgarh.

(d) *Udaipur area* includes the zinc smelter, cement factory, cotton spinning mill, distillery, chemicals and pharmaceuticals, wood articles and toys, etc. Besides these, and above all, tourist industry has been flourishing here because of beautiful natural surroundings of Udaipur and also its moderate climate. Girwa tahsil in which Udaipur city is situated has 11.4% of the total workers engaged in industries and the city of Udaipur employs 16.4% of the total workers in industries (1961) and the number is estimated even more during the current decade.

(e) *Alwar area*, situated along Delhi-Ahmedabad NH 8 and Ajmer-Delhi metre-gauge line of Western railway, includes vegetable oil and dal mills, chemicals and other factories. Alwar tahsil has 13.6% of the total workers engaged in industries (1961). The percentage of industrial workers to total workers is 24.5 for Rajgarh and 20.4 for Alwar.

Transportation and Communication

The Region with 41 percent of the total population and 17 percent of the area of the State, has only 13 percent and 15.7 percent respectively of the State's total length of railways and roads. The recent urban and industrial development as well as increased tourist traffic have, however, given much impetus to the development of means of transport and communications in this region. The transport system of the region consists of a net work of all types of roads and metre gauge railway operated by the Western railway, measuring only 40,060 and 1,150 route kilometres respectively. Jaipur and Udaipur are linked by Air with Delhi, Agra, Ahmedabad and Bombay (Fig. 13.13).

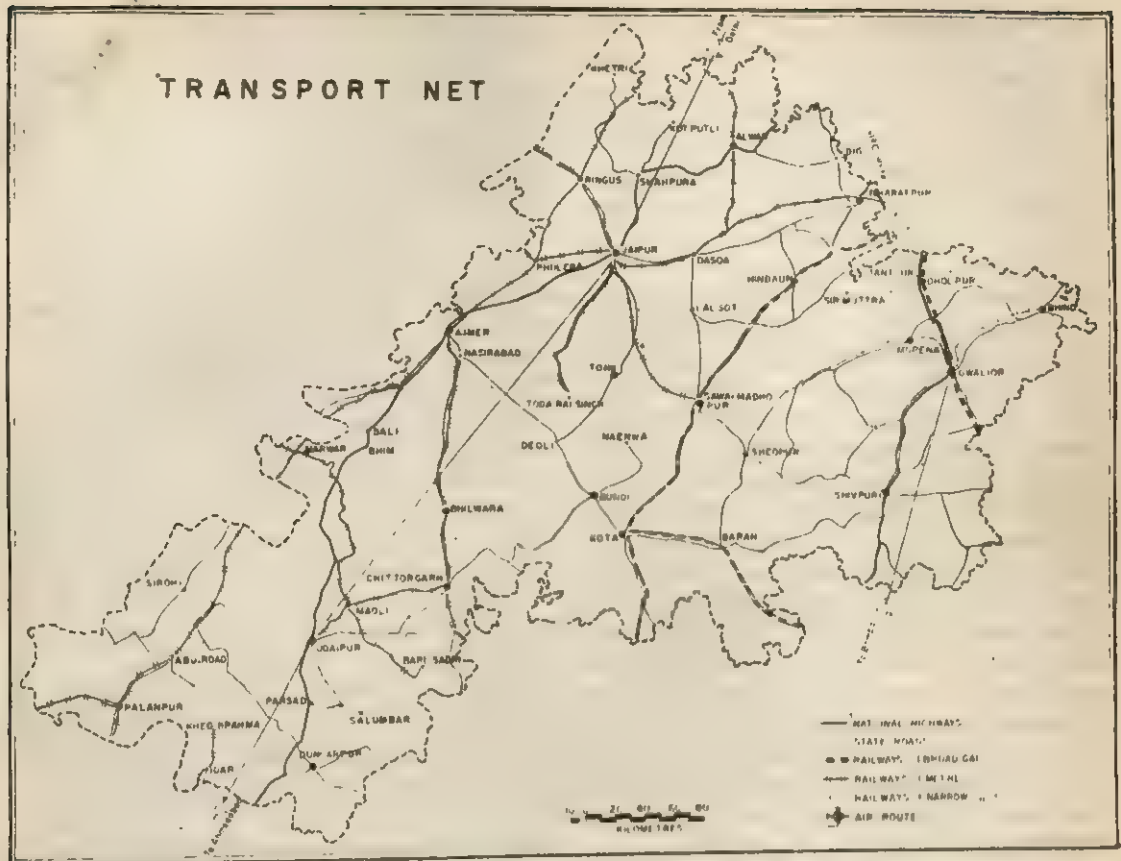


Fig. 13.13

The Region, however, lacks interlinked transport system, or in other words, there is little developed net work of transport between points of production and distribution. The facilities for transporting agricultural produce to markets are not available all the year round because of availability of only fair weather cart tracks and that too are not linked with metalled roads of regional importance. Thus, lack of dependable intra-regional and local transport system has retarded its agro-industrial development.

It is estimated that only 45% of roads is metalled. Thus for 41 percent of the population of the State, the region has only 7 percent of the total length of metalled roads. The road length which comes to only 4.2 km per thousand persons also seems inadequate enough for a fairly satisfactory

mobility of traffic. There seems to be no balance and coordination between road and rail as means of transport because while, on the one hand, the former has provision of 1 km for 1.4 km² of area, the latter, on the other hand, shows only 1 km for as much as 50.7 km² of area. Further, the road-net suffers from many handicaps such as lack of adequate number of bridges, hard and tar surfacing and inadequate provision for repair or renewal, etc.

Traditionally camels and carts drawn by bullocks, horse etc. have been important modes of transport.

Jaipur, Ajmer and Udaipur are the principal nodes of transport, particularly of roads; other important centres of road transport are Alwar, Sikar, Beawar, Bhilwara and Chittorgarh. These

are regional centres linking other local towns and market centres of the region with railways but more frequently with roads

Among all the roads, the National Highway No. 8 traversing the entire region from north to south, is of prime importance for the movement of goods and passengers and is the region's traffic backbone. Its length from Delhi is 1,435 km of which about 45% lies in the region. Next in importance are the Ajmer-Kota (192 km), Ajmer Bhilwara (133 km), Bhilwara-Udaipur (208 km), Bhilwara-Chittor (56 km), and Udaipur-Chittor (115 km) roads. These are all-weather and tarred roads and connect all the important regional towns.

The net-work of the road system in the northern and central parts is denser than the southern half of the region.

The most important railway is the Delhi-Ahmedabad main metre gauge line connecting Alwar, Bandikui, Dausa, Jaipur, Kishangarh, Ajmer, Beawar, and Abu road. It is the main railway line carrying the heaviest traffic of passengers as well as goods in the region. Next to it is the Ajmer-Khandwa or the Malwa section serving the central part of the region and linking Ajmer with Nasirabad, Bhilwara and Chittorgarh. The other less important railway routes are of sectional importance.

The southeastern part of the region with an area of about 4,000 km² remains untouched by railways. Recently completed Udaipur-Himmat Nagar section of the Western Railway connects the area with Ahmedabad.

The Chambal-Sindh Basin

The Chambal-Sindh Basin carries a population of 6.42 million (1961) which is unevenly distributed over 74,101 km² of its area with an average density of 87 persons per km². Most of the districts of the region have lower density than the national average. The highest density (145) is credited to Bhind followed by Bharatpur (143) and Gwalior (124). The most sparsely populated district is Shivpuri (55), followed by Bundi (61), Morena (68), Kota (69) and Tonk (70). The average physiological density

of the region is 183 persons per km² of cultivated land. In this respect Gwalior (285) has the highest followed by Bharatpur (229), Morena (214), Bhind (195) and Sawai Madhopur (184). The Bharatpur plain, with a flat alluvial topography, about 67 cm of rainfall, seasonal water supplies of the Banganga and the Rurpatel rivers, well-conserved through *Bund* irrigation, has a physiological density ranging between 150-250. The highly productive Dholpur Plain, inspite of the Chambal ravines rendering its 23.4 percent area uncultivable, has higher physiological density than the rest of the Bharatpur Plain. The Banganga-Banas (192-240), the Gangapur Mal tract (90-200), the Morena Plain (90-240) and the Sindh Plain (85-225) are other regions of higher physiological density. The Karauli tableland with a dissected topography, strewn with boulders and scrub jungles and much uncultivated land (ranging from 53.6 percent in Bari tahsil to 78 percent in Mandrail tahsil) is one of the most sparsely populated tracts of the region. But in the sheltered valleys with irrigation facilities, though limited to small territories, densities ranging between 200-320 persons per km² are met with. In fact, these highest physiological densities are found in Sapotra and Mandrail tahsils (Sawai Madhopur) which show intense pressure of population on limited cultivated area.

Growth of Population : The growth rate of population in the region during the last sixty years (1901-61) has been relatively slow (53.3%) as compared to the national average. At district level, high growth rate has been recorded in Bundi (97%), Tonk (93.8), Gwalior (62.1) and Kota (60.6) while the densely peopled Bharatpur records the lowest increase (28.4%); Morena (36.9), Shivpuri (46.2) and Bhind (48.2) have also experienced lower than the regional average. The patterns of variation are associated with such factors as droughts and famines and varying degree of economic development.

The census year 1921 is significant point in time to analyze the growth and trends. During 1901-11 the population recorded negligible increase as by Shivpuri, Tonk, Kota and Bundi, while other districts suffered losses at the hands

of famines and plague epidemics. The decade 1911-21 proved more disastrous because of widespread influenza epidemic accentuated by famines and resulted in a decrease of 8 percent as compared to 0.31 percent for India as a whole. Gwalior district was an exception because of immigration to the city of Gwalior which registered an increase of 34.60 percent.

During 1921-61 the Region recorded steady growth of population which has been shared by all districts but with varying degrees. The most spectacular increase occurred during 1951-61 when it registered an increase of about 21.25 percent. During this decade the largest increase in population was registered by Bharatpur (26.72%) followed by Kota (26.61), Gwalior (24.08), Morena (23.64), Sawai Madhopur and Tonk (23.32% each). The districts recording an increase below the national level (21.5%) are Shivpuri (17.19), Bundi (20.49) and Bhind (21.44).

The recent trends indicate that population has increased in the areas where economic development has been stepped up. The Chambal Valley Project with its irrigation facilities as well as hydel power supplies has pushed up agricultural development in the districts of Kota, Morena, Gwalior and Bundi. The industrial development, particularly in Kota and Gwalior districts, has attracted immigrants from outside. The gains of Bhind have been partly mitigated by anti-social activities.

Sex Ratio : There is a marked paucity of females in the region as there are only 867 females per 1,000 males. Moreover, there are sub-regional variations in sex ratio. The lowest sex-ratio has been reported for Morena (839), while the relatively high ratio has been recorded for Tonk (910), Kota (897) and Shivpuri (885). Gwalior district has a low sex ratio (859) because of the high ratio of urban population (49.3). The lower Chambal plain has a more adverse sex-ratio than the plateau and hilly tracts of the Region. This traditional pattern has persisted for long.

Age Structure : The heavy concentration (40.8%) of the regional population below 14-age group means "continued increments in popula-

tion in the unproductive population for a prolonged period and infructuous cumulative expenditure". The active age group (15-59) accounts for about 54 percent of the total population, females comparing more favourably with males.

Occupational structure : Workers comprise 40 percent of the total population. The working force is the least in Kota district (33) followed by Gwalior (37.0), Bhind (37.8), Bharatpur (43.8), Morena (44.6), Bundi (50.0) and Tonk (56.6). The distribution shows that the percentage of working force increases with the harder environmental conditions where efforts are less favourably matched by returns.

The occupational structure of the working force shows the predominance of the workers engaged in agriculture (84.67%) which reaches 90.1 percent in Bharatpur followed by Morena (87.4), Sawai Madhopur (87.3), Shivpuri (85.6) and Bhind (85.0). In Gwalior district other occupations are also important (industry 15.6%, trade and transport 10%, and other services 15.1%).

Rural Urban structure : The Chambal-Sindh Basin is essentially rural, with hardly 16% as urban. The most urbanized district of the Region is Gwalior which accounts for nearly one-third of the total urban population. Gwalior (300,587) itself is the largest town. Kota district (18.9%) has higher urban percentage than the regional average. Districts below the regional average are Bundi (15.3 percent), Tonk (14.7), Bharatpur (13.7), Sawai Madhopur (10.2), others being far behind with Shivpuri (7.0) as the lowest.

Of the total rural population nearly 48.8 percent resides in the medium-sized villages (500—1,999), about 9.2% in large villages (2,000 and above) and about 42% in small villages (less than 500) in contrast to the high proportion in the Aravalli region. The population and frequency of large villages increase in area with insecurity of life and property as well as well-watered, fertile plains. The feudal system has also contributed to the concentration of people in large villages. Bhind district has on an average 714 persons per village as against 433 persons in Gwalior division and 448 persons in East Rajas-

than plain (Gangapar Mal Tract 453, Karauli tableland 349, Ramganga Basin 522 and Dholpur plain 435). The number of depopulated villages is also large in the lower Chambal Valley infested with ravine lands.

Literacy Pattern : Hardly 11 percent of the population of the region can be called literate. The highest literacy goes to Gwalior district (27.9 percent) which has the largest city with a University seat. The rural areas of Gwalior district have only 14.3 percent literates as against 41.8 percent in urban areas. The Gwalior division has only 12.5 percent literates in rural areas and 39.9 percent in urban areas, while the average for the Division is 17.1 percent. The position is worst in Bundi district (7.8%), accompanied by Tonk (8.4), Sawai Madhopur (10.8) and Bharatpur (12.5).

Population as A Resource Base

The Chambal-Sindh Basin has moderately adequate population resource; with 21.25 percent decennial increase (1951-61) and a fairly moderate percentage of workers (40 percent) coupled with fairly high participation of female force, hardworking and sturdy people the region has great prospects. But too heavy dependence upon agriculture (84.67 percent of the total workers), low degree of urbanization (15.9 percent) and very low literacy (11 percent) as well as low development of technical skills militate against the qualitative development of the population resource. The fear psychology created by anti-social problem (dacoity etc.) has acted as a constraint upon its socio-economic stability and uplift.

Rural Settlements

The villages in the region are larger in size, both in area and population, with significant sub-regional variation. In Bharatpur the village on an average covers an area of 2.6-4.5 km² and has a population of 362 persons, whereas in Karauli tableland 5-10 km² and 499 persons; in Malpura tract (Tonk) 7-11.5 km² and 453 persons; Gwalior 5-7 km² and 433 persons, and Bhind 5.5-7.5 km² and 714 persons. This patterning can be understood in the background of its natural conditions, historical setting and socio-economic factors.

Here the farmsteads are conspicuous by their rarity; nucleated and compact villages with a medieval aspect predominate. The fragmented settlements are fewer and are confined to areas of dissected topography, infertile soils and scrub jungles. The village often seeks a water-point site, may be a stream, a tank, a *kund* or a well, where regular supply of water is assured. If it is near a stream or river, it seeks a dry-point site which is free from inundations. The river bluffs are attractive sites for linear or arcuate type of settlements. The political instability, characterised by organised banditry as well as confiscatory taxation, have forced the farmers to congregate in large villages for defence. In many villages there are remains of old forts or *garhis* or surrounding walls. Social and cultural factors have a visible impact on the village morphology. Often the old site is crowded and congested, but small hamlets belonging to scheduled caste people or artisan castes or landless labourers may stand apart at a distance from the main village site. This phenomenon occurs here in an accentuated form because of the feudal system which has continued for centuries. In the northern part of Bharatpur the Meos (Mewatis) live in close-packed villages where a high wall with a common entrance shelters many dwellings within a common compound. In the central parts of the district where mixed population of the Jats, the Ahirs and the Brahmans is found, this pattern of settlement gives way to much openness and separate compounds. The Gujar villages, in its southern part, are often tiny in size and lie scattered apart. In the Karauli plateau where stony wastes and scrub jungles are found, there are few attractions for human settlements but here the Gujars live in tiny hamlets by practising stock-raising on the poor pastures. During recent decades a change is noticeable, particularly in the areas where security problems are not serious.

The predominant material of wall is earth whether used as mud, unburnt bricks or burnt bricks matched by stone, particularly in the hilly districts and followed by scarce use of timber and bamboo. The predominant materials of roof are tiles, slates and shingles, followed by concrete and stone and

thatches of grass, leaves, reeds and wood or bamboo. In the lower Chambal Valley and Bharatpur district earthen houses with flat or thatched roofs predominate, while in Gwalior, Shivpuri, Kota, Bundi and Tonk, tiles, slates and shingles are frequently used in roof covering. One-storeyed buildings are most common; two-storeyed stone houses are found in the hilly areas where building stone is easily available. In Dholpur plain, the houses are often built of mud or stone and have flat roofs in some parts and sloping roof in others. In the sandy tracts the houses are generally built of reeds plastered with mud and are also isolated from each other. The prosperous agricultural regions have substantial houses.

Birpur Village : Birpur village ($26^{\circ}0'5''$ N and $78^{\circ}30'0''$ E) located on the Agra-Bombay National Highway, 3.2 km south-west of Lashkar, provides an interesting study of a hamleted cluster whose population (869) is scattered over the village land (75 hectares) in one main site and 12 hamlets.²⁰ The main village as well as three big hamlets occupy the hills located in the southwest corner (Fig. 13.14). The main village (Mata-

hamlets (8) are just a recent growth. There are 7 hamlets which have 5 families or more. The hamleted cluster owes its existence to the Kachhis, the main cultivating caste and vegetable growers whose 119 families comprise a population of 848 persons. They prefer to live as close to the fields as possible. Besides the Kachhis there are only two families, one Thakur family and one Muslim family.

The intensity of land utilization has also contributed to fragmentation and centrifugal trends which are rare for the Chambal-Sindh Basin. 70.47 percent of the net cultivated area is irrigated which has encouraged vegetable gardening, particularly for vegetable supply to Lashkar. The village has as many as 25 electric motors to operate its wells. These installations need guard and hence agriculturists have moved out to their fields and have built up their farmsteads or small hamlets.

There are 245 houses in the village, of which 224 are *Kachha*. The single-storeyed thatched houses are preponderant. Of late *pucca* houses are finding favour and there are some double storeyed buildings made of burnt bricks and stone.

Garh Himmat Singh Village ($27^{\circ}9'$ N. and $76^{\circ}54'$ E; 1961 Pop. 3,440) is situated 15 km from Mahuwa, the tahsil headquarters (Sawai Madhopur district). The village developed near the fort established by Himmat Singh in A. D. 1745 who settled the Gujars and Naiks here. It is a planned village; the east-west main road is lined with about 100 shops, and several lateral roads bifurcate from it on either side and run parallel to each other, thus providing a geometrical rectangular shape to the settlement (Fig. 13.15). Mostly in the central part of the village generally double-storeyed masonry buildings are found while *kachha* mud-cemented stone walled and thatched roof houses or mixed types are found on the periphery. Of over 600 houses, about 30% are *pucca*. The village has some hamlets outside, inhabited separately by low castes such as those of Malis, Meenas, sweepers, Khatiks; the main village is occupied by Brahmans, Mahajans and Jains and artisan castes like goldsmiths and bakers. There are also some Muslims.

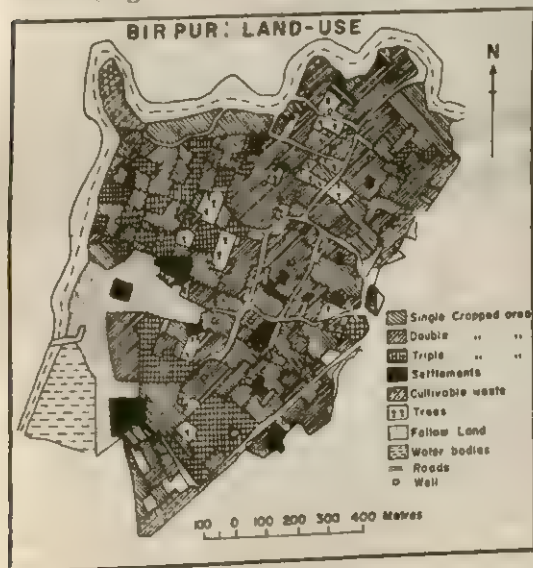


Fig. 13.14

ki-Pahari) where lives the old zamindar Thakur family is said to be 250 years old whereas the

About 80% of the village land is agricultural, and three crops are raised among which bajra, barley and jowar are important. About 53.8% of the cropped land is irrigated through wells and tanks; the village has 60 wells, of which 9 are used for domestic water supply. The farmers have now taken to modern agricultural practices such as improved seeds, implements and chemical fertilizers. There are about 1,800 heads of live-stock of which less than 1/3rd is sheep and the rest are cattle.

Urban Settlements

The Chambal-Sindh basin shares the credit of having ancient, medieval and modern towns. Gwalior itself has an ancient heritage with an amalgam of the medieval period and a super-structure of the modern period. Bundi claims its association with the Mahabhrat period. The village Kanva (ancient Kanvasharam), located

about 6 km south-west of Kota, has an inscription depicting the Maurya heritage. The Chaori at Mukundwara is believed to belong to the 5th century A. D. Deeg, about 38 km from Bharatpur, is an ancient town mentioned in *Skana Purana*. Bharatpur was founded about 300 years ago. Dholpur is a medieval town, so also Tonk. Shivpuri finds its first mention in 1564 and as a British Cantonment in 1835. Bhind was founded by the Bhadauria Rajputs in the 17th Century. The fort at Gohad is its contemporary. Lashkar was founded by the Scindia in 1810 as a township, while Morar was established as a British Cantonment for keeping an eye on the rising power of the Scindia.

The towns mostly functioned either as political headquarters (Capitals) or defence headquarters (forts and garrisons). With the fall of a dynasty or shifting of the capital, the capital city dwindled into insignificance and the new city emerged.

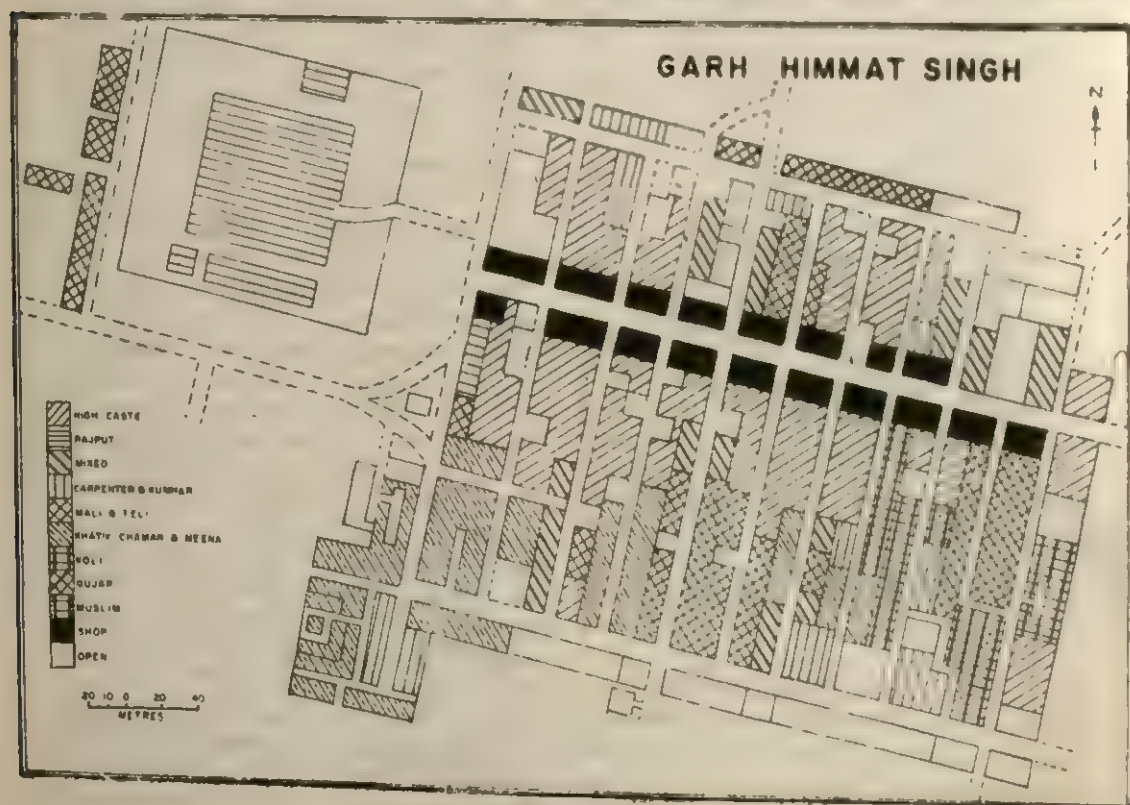


Fig. 13.15

Commerce and industry (handicrafts and cottage industry) rather gravitated to the towns which were founded primarily for non-economic reasons as state capitals, fort towns or religious centres. Gwalior or Kota with modern innovations (commerce industry, etc.), is now acting as a powerful agent of social change in this region.

At present there are 44 towns including two Class I (Gwalior and Kota). There are 12 Class III towns such as Bharatpur (49,776), Tonk (43,413), Shivpuri (28,681), Morena (28,681), Bhind (28,208), Dholpur (27,412), Bundi (26,478), Karauli (23,696), Baran (22,764), Gangapur (22,591), Sawai Madhopur (20,952), Hindaun (20,237), and 9 of class IV towns—Deeg (17,668), Bari (14,695), Shespur (14,591), Lakheri (13,725), Dabra (12,661), Bayana (12,223), Kaman (12,140), Malpura (10,622) and Gohad (10,289).

Most of the towns have remained more or less stationary except Gwalior and Kota. Gwalior has recorded an increase of about 118 percent during 1901-61, while Kota registered an increase of about 258 percent. Bharatpur, the third largest town, showed a decline from 67,555 in 1891 to 30,173 in 1931, and has increased to 49,776 by 1961. Somewhat similar trend is observed in Tonk, the fourth largest town. Bharatpur which could not attract any industry lost its importance as a market centre and army headquarters, suffered the rigours of poverty, emigration and insanitary conditions, declined in population, but of late it has attracted the attention of the Government and a wagon factory has been established, thereby showing sign of recovery. Kota benefited by the Chambal Valley Project and hydroelectric supply, has attracted a number of industries, trade and administrative offices whereby its population presents a phenomenal rise. The occupational structure of Kota shows that of the total workers 14.5 percent are engaged in industry (large scale as well as household), 11.25 percent in construction, 14.25 percent in trade and commerce, 15 percent in transport and communications and about 20 percent in other services.

Greater Gwalior, the town group, is constituted by the oldest settlement of Gwalior, lying at the

foot of the Gopagiri, Lashkar, a township about 3 km south and Morar cantonment, and covers an area of about 62.45 km². Its strategic location at the junction of the Vindhyan scarps and the alluvial plain in the natural corridor between Agra and Bombay, the route which was frequently used by the Moghuls and whose significance was fully recognised by the British rulers who connected it by the Great Peninsular Railway (now Central Railway) gave it an unsurpassed advantage and continued significance. The hills encircling it on three sides with an open valley in the north-east, well-protected by the historic fort, destined it to be a great capital when the needs for defence were paramount. Its dynamism and adaptability have sustained its importance as the regional capital.

Gwalior derives its name from its famous rock fortress. It was founded in the first century A. D. by a Kachhwaha Rajput named Suraj Sen as 'Gwalidwar', later corrupted into 'Gwalior' or 'Gwalher' and finally 'Gwalior'. Gwalior became a centre of attraction for successive Muslim invaders. Ultimately it fell in the hands of the Marathas, whose Scindia clan ruled it for over 200 years. Daulat Rao (1794-1827) laid the foundation of the modern Gwalior town. In 1810 he founded Lashkar which grew into the capital city and eclipsed the old city by 1857. In May 1948 the Scindia rule ended and Gwalior became the winter Capital of Madhya Bharat. With the amalgamation of Madhya Bharat it became a divisional headquarters and later on a University seat and is now the largest town of the region.

Lashkar is the most densely settled part (750-1,000 persons per hectare).²⁷ The zone of high density (500-780) lies towards north-west of Bara area in the oldest section of Lashkar. The zone of low density (less than 250 persons) includes old Gwalior and surrounding localities, Morar township and cantonment.

The occupational structure of the population shows the highest concentration in industrial activities (34.4 percent), followed by other services (30.5), trade and transport (27.6).

The layout of Greater Gwalior is controlled by its topography, its encircling hills and open plain

(Fig. 13.16). That is why it could expand only in the north and east, and not towards west and south-west. The commercial core of the city has developed in Lashkar covering most of the area around Bara, Dal Bazar, Madhavganj, Phalka Bazar and Janakganj. "Roughly more than 50

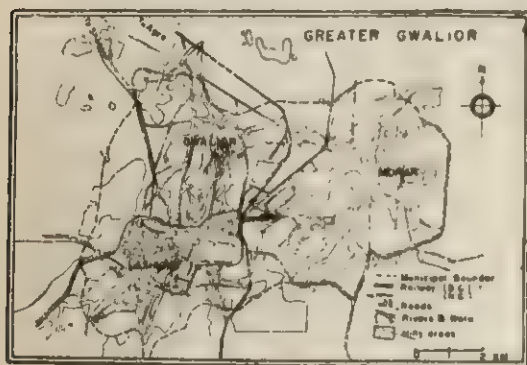


Fig. 13.16

percent of the population of Greater Gwalior and 40 percent of the total number of houses of the city are concentrated in this zone." The middle zone enclosing the inner zone lies in an elongated form in the north-east to south-west direction from Phool Bagh to Mama Ka Bazar. The entire area lying between Lashkar, Old Gwalior and Morar may be broadly called outer zone. The industrial zone of Gwalior lies within a radius of about 3 km between Morar cantonment and old Gwalior on the north-eastern rim of Birla-Nagar, Fort Road and Tansen Road on either side of the Central Railway track. Here are located two large-scale industries (A. C. Cotton Mills and Gwalior Rayon & Silk Manufacturing Co.), five medium-scale industries (J. B. Mangharam Biscuit Factory, Gwalior Leather Factory, Gwalior Potteries, Gwalior Engineering Works, and Motilal Agarwal Mills) and an industrial estate.

The townscape of Gwalior has two contrasting morphological aspects. The old city of Gwalior as well as some parts of Lashkar show a natural growth characterized by unplanned development, narrow lanes, congestion, old types of clustered houses and little open space, while the civil lines, Morar township and new residential colonies have well laid street patterns, modern planned houses

and parks, etc. The old Gwalior city has some of the slum areas in Ghauspura, Hajira and Rasoolabad.

Bharatpur is situated about 60 km west of Agra, virtually at the confluence of the Ruparel and the Banganga whose waters stored in Moti Jhil Bund, Ajan Bund and Atal Bund feed the moat surrounding the fort. In fact, the excessive floods have endangered the town due to its low-lying site which has to be protected by a high embankment. A high metalled road encircles the town; the moat and fortification wall have given it an elliptical shape (Fig. 13.17).



Fig. 13.17

The town has expanded in two directions, towards the railway station and along the Agra road. The civil lines of Bharatpur lie on the Agra Road outside the fortification wall, so also the new grain market and its associated colony near the railway station.

Dholpur named after Raja Dhaul, its founder, is situated on the left bank of the Chambal. During the medieval period the town was located near the river for defence. Its old site is occupied by a dilapidated fort. Later on, it was shifted about 4 km towards north. The palace of Maharaja Kesar Singh stands on a 305 m high Vindhyan scarp, about 11 km to the west of the

town. The sacred tank of Machkund lies about 5 km to the west.

Dholpur has four detached sectors : (i) old Dholpur of which the only remnant is the dilapidated fort, (ii) the 'Shahar' or city (iii) the 'Kothi' or present Civil Lines, and (iv) Purani Chhaoni which has a large palace, part of which was used as the Jail. On the whole Dholpur appears to have a natural unplanned growth but some of its parts like the Machkund Road are well-planned. The buildings are mostly built of red sandstones. Purani Chhaoni is a well-laid township. It has a long straight market which ends at the gate of the old palace. The buildings have a square plan.

It is almost a static town with a population of 27,412 because of lack of industrial and commercial development, emigration and also dacoity problem of the area.

Agricultural Economy

It is an agricultural region with 84.67 percent of the total workers engaged in agriculture. It is primarily a food crop producing area (87.5 percent of the total cropped area) but the yields per hectare are lower (20-40 percent less than the national average) because of poor irrigation facilities (hardly 12 percent irrigated area), much less use of manures and fertilizers and low level of technological improvements. On the whole the agricultural efficiency is rather poor. Mixed farming and inter-culture are important.

Only 44.7 percent of the total area is net sown with marked regional variations. Bhind carries the highest percentage (73.9) of the net cultivated area with fertile alluvial plain. The district grows mostly rain-fed crops because the irrigated area is barely 12.1 percent. The percentage of the double cropped area is also very low (1.4) while the fallow land is hardly 0.8 percent. The tahsils of Gohad and Mahagaon have the apprehension of serious water logging problem. Next come Tonk (67.9 percent) and Bharatpur (62.8) which lie in its northern part, less favoured with rainfall but well-supplied with irrigation. In the Malpura and Gangapur and tracts of Tonk the irrigated area is about 22.5 percent of the net

cultivated area, while in the Bharatpur plain irrigated area ranges between 22.5 and 35.5 per cent. In these districts the double cropped area is fairly high (Bharatpur 11.9 percent and Tonk 6.5) and the farmers leave fallow land (Tonk 13.3 percent and Bharatpur 8.1). The average percentage of the net cultivated land in Kota district is 58.9 (Fig 13.12) but Kota Plain because of irrigation facilities and fertile soils is one of the most intensively cultivated areas, which has been benefited by the Chambal Valley Project. In the Digod tahsil of Kota waterlogging is posing a serious problem.

Bundi has barely 39.3 percent net cultivated area because of the preponderance of the hilly terrain, barren lands, unculturable wastes and forests. Bundi is facing a serious soil erosion problem where "10 percent area suffers from sheet erosion and 23 percent of the area is infested by ravines and gullies."

Shivpuri district carries the least net cultivated area (26.4 percent) because of its inhospitable terrain and lack of irrigation facilities. Morena also is a poorly cultivated district (31.4 percent net cultivated area) because of its varied topography, ravinelands and soil erosion problem. Gwalior district carries 43.6 percent net cultivated area of which about 4% is double-cropped.

Rabi crops have an upper hand over kharif crops. Gram-Jowar-Bajra-Wheat comprise the most popular combination. Barley, tur and oil-seeds comprise a strong supporting group. Rice, maize and sugarcane are the least favoured crops.

In terms of production and importance wheat is unsurpassed. The highest intensity of its cultivation is found in Gwalior district where it claims about 33 percent of the total cropped area followed by Bundi (29.3), Sawai Madhopur (15.5), Kota (13.3), Morena (12.5) and Bharatpur (11.3). One of the important features of wheat cultivation is that hardly 14 percent of its total area is irrigated.

Claiming about 80 percent of the total area under pulse, gram occupies the largest cropped area (about 25 percent); its largest concentration is in Bhind (28.3 percent) followed by Morena (27.5), Sawai Madhopur (24.4) and Bharatpur

(22.8), while Shivpuri is the least important (9.24 per cent).

Jowar and bajra are the most important millets; together they excel gram in several districts. Morena leads in their cultivation by devoting nearly one-third of its total cropped area. Bharatpur district stands second (28%) followed by Shivpuri (27.3), Sawai Madhopur (24.3), Tonk (24.2), Kota (20.2), Bhind (19.5) and Bundi (18.7).

Oil-seeds have the largest concentration in Bharatpur (19.6 percent of the cropped area) followed by Bundi (17.6), Kota (16.8), Shivpuri and Morena (12.15). The most important oil-seeds are linseed, rape, mustard and sesamum.

Barley is an important cereal, particularly in Tonk, Sawai Madhopur, Bundi, Bharatpur and Shivpuri. Rice, though cultivated in every district, is a minor crop. Similar is the case with sugarcane which hardly claims 1 percent of total cropped area. Condiments and spices are of great commercial value. Among the fibre crops sunhemp and *mesta* are quite popular.

Irrigation is one of the main agricultural requirements of the Chambal-Sindh basin because of its semi-arid condition. Hardly 12 per cent of its net sown area is irrigated. The most favoured district is Gwalior (22.1%), followed by Bharatpur (21.2), Shivpuri (15.1), Tonk (14.7), Sawai Madhopur (13.6), Bhind (12.1), Bundi (12.0), Morena (9.3) and Kota (5.2).

The chief sources of irrigation are canals, wells, tanks and other means in order of importance. Canal irrigation is important in Gwalior, Bhind, Morena, Kota and Bundi districts, well irrigation in Shivpuri and Morena and tank irrigation in Bharatpur, Sawai Madhopur, Tonk, Bundi and Kota.

The most important irrigation project of the region is the Chambal Valley Project. It will irrigate 5 lakh hectares or the region divided equally between the two States. It has a network of two canals of 261 km length in Rajasthan and 641 km length in Madhya Pradesh. Other projects like the Harsi Dam Project on the Parbati in Gwalior district and Pagara Dam in Bhind are small. Bharatpur has a network of small canals. It has also developed the *Bund* irrigation (inundation canal).

Industrial Economy

The Chambal-Sindh Basin is industrially under-developed. Hardly 4.3 percent of its total workers are engaged in industries, of which household industries claim nearly 80%. Gwalior is the only centre where modern industrialization made a beginning in the early twenties of the present century. Maharaja Madhav Rao Scindia took the initiative and established a Board of Economic Development in 1920 for advising on all schemes of economic and industrial development. He provided free land for factory sites and patronised the industries. With the result, Gwalior is today the industrial metropolis of the region, providing employment to 26,326 workers in manufacturing industries and about 4,000 workers in household industries and having an industrial complex of engineering, textiles, leather, potteries and food industries as well as an industrial estate. Next in importance is Kota which with cheap hydroelectric power supply from the Chambal Project has attracted a number of industries which are in a developing stage. The Govt. of India has established a precision instrument factory. Other important regional industries are cement and glass works.

Cotton textile is the most important industry of the region which has two cotton mills (Gwalior and Kota). Jayaji Rao Cotton Mills at Gwalior has 769 looms and 24,572 spindles. There are four small woollen factories one each at Bharatpur, Sawai Madhopur, Tonk and Kota which produce wool of fine medium to coarse varieties. The Gwalior Rayon and Silk Manufacturing Co. Ltd. produces art silk, velveteen and tapestry goods.

Engineering industries are located at Gwalior, Kota and Bharatpur. The Gwalior Engineering Works now produce a wide range of steel furnitures, agricultural implements, etc. Central India Machinery Manufacturing Co. has specialised in the production of textile machinery employing 2,000 workers. Bharatpur has a public sector railway wagon factory (Fig. 13.6).

There are three cement factories located at Lakheri (Bundi district), Sawai Madhopur and Banmor (Gwalior distt.) based on abundant local supplies of good limestone. Of the total pro-

duction of 12.6 million tons (1965-66) in India, Chambal-Sindh Basin contributed 1.7 million tons.

At present there are two large glass factories at Dholpur and Kota with 1,225 workers, producing laboratory wares and bottles. There are fine glass sand deposits in the districts of Bundi, Sawai Madhopur and Bharatpur which can help in the building up of large factories there.

Cottage and small scale industries are important from the point of view of employment potential as well as the variety of products. They mostly produce articles for local and regional consumption, but some of them have also entered the national market. There are two *dari* and carpet factories at Gwalior which manufacture high quality products with a good market outside the region. There is an umbrella factory (Gwalior) which is turning out 40 dozens of umbrella per day. Gwalior is also noted for clay and paper-made toys.

Transport and Communications

Terrain difficulties coupled with drainage disabilities and political and tariff barriers long stood in the way of coordinated development of a transport system and thereby reduced the effectiveness of the available resources. Relative paucity of goods and passengers provided little incentive for their expansion and development.

There are in all about 1,307 km of railways which are shared between central and western zones. Only the Bayana-Kota and Agra-Gwalior-Jhansi lines are broad gauge, the rest are metre or narrow gauge. The narrow gauge railway lines were built by the two princely states. The former Gwalior State took the initiative and connected Gwalior with Bhind, Shivpuri and Sherpur-Kalan (Morena) by three narrow gauge lines measuring about 418 km. The difference of gauges poses a bottleneck problem at Gwalior, Kota, Bharatpur, Sawai Madhopur and Dholpur.

Of all the parts of the region, Gwalior is best served by railways, being an important junction on the Central Railway, but its location in the southwest corner, strangled by terrain difficulties, places it at a great disadvantage. The railway system is disjointed mainly because of the Cham-

bal (which has not been bridged anywhere else between Kota and Dholpur), and the hills and plateaus (Fig. 13.13). Gwalior-Sherpur-Kalan (Morena) railway line runs through in the alluvial plain of the Chambal on its right bank and scrupulously avoids the Vindhyan scarp-lands of Morena district. Similarly, the Bayana-Kota railway runs along the northern flanks of the Karauli tableland, enters the Kota Plain through the gap made by the Banas River and makes a detour to Kota along the left bank of the Chambal. Sawai Madhopur and Sherpur Kalan, though hardly 50 km apart, have no inter-connection because of the Chambal ravines. Many of the termini of the branch lines are the result of terrain obstacles.

The Chambal-Sindh Basin, lying in the historic corridor of Central India, attracted the attention of the Moghuls who laid the foundations of the Agra-Gwalior-Narwar-Sironj Highway. Between Gwalior and Dholpur on the bank of the Sankh stood Nurabad, the historic halt, where the bridge reminds one of the marvels of the Moghul architecture. The British rulers made it a pucca road in the forties of the last century which has been converted into the National Highway No. 3 connecting Agra, Morena, Gwalior, Shivpuri, Indore, Dhulia, Nasik and Bombay. Two other National Highways, viz., Gwalior-Etawah and Gwalior-Jhansi meet it at Gwalior. The National Highway No. 11, emanating from Agra, extends its connections towards western Rajasthan through Bharatpur district to Jaipur and Bikaner. These National Highways and other State roads give it about 3,316 km of first class metalled roads. The National Highways serve, through the State and District road links, the region more intensively than the railway, though they have also failed to develop a close-knit and well organized system due to terrain difficulties. Sawai Madhopur and Sherpur Kalan are linked by a road which is really a fair weather road in the absence of an all-weather bridge across the Chambal. Most of the district roads are gravelled and are fair weather roads.

Because of the seasonal vagaries of the river regimes as well as their ravine-infested banks there

are no inland waterways. But the region is on the air map of India, with air strips at Gwalior and Kota.

The Regions

As discussed in the foregoing, the Udaipur-Gwalior region is divided into two first order units, the Aravalli Uplands and the Chambal-Sindh Basin, joined together along a NE-SW axis with Gwalior and Udaipur as the pivots at the respective ends; further, it is around Udaipur that the core of the system was formed as also its conspicuous development. The Aravallis and the Vindhya are also juxtaposed along the great boundary fault while the Aravalli crest runs all along the axis and serves as a physical as well as a cultural divide or blockade as the name of the range itself suggests (Aravalli=Adda+valli, the former meaning a blockade and the latter a ridge-line in Rajasthan).

The two regions are further divisible into six regions of second order and seventeen regions of third order according to the following region scheme (Fig. 13.18) :

XII. Udaipur-Gwalior Region

25. Aravalli Uplands

(a) North Aravalli Region :

(i) Sambhar Basin, (ii) Alwar Hills

(b) Central Aravalli Region :

(i) Merwara Hills, (ii) Malpura Uplands

(c) Southern Aravalli Region :

(i) Abu Block, (ii) Mewar Hills, (iii) Middle Mahi Basin, (iv) Banas Plain (Upper).

26. Chambal-Sindh Basin

(d) Middle Chambal Basin :

(i) Kota or Harawati Upland, (ii) Kota Plain, (iii) Lower Banas Plain, (iv) Morena Plateau

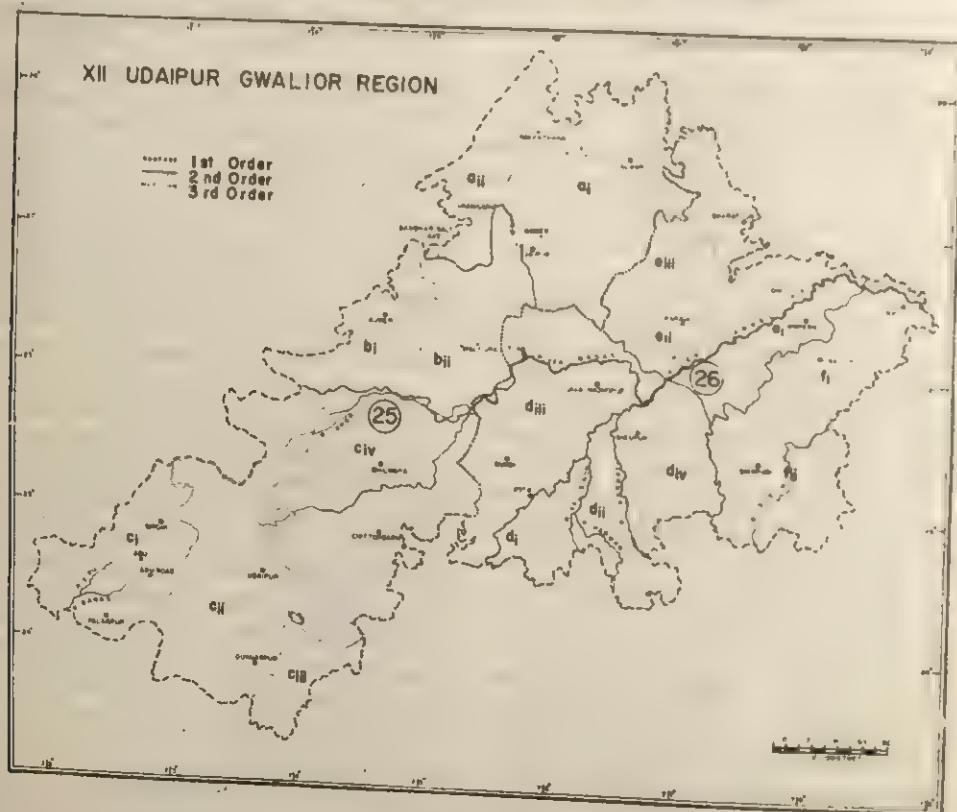


Fig. 13.18

(e) Lower Chambal Basin :

- (i) Morena Plain, (ii) Karauli Plateau,
- (iii) Bharatpur Plain

(f) Sindh Basin :

- (i) Gwalior Plain, (ii) Shivpuri Plateau.

The Aravalli Uplands exhibit three geographical regions, the Northern, Central and Southern. In the demarcation of the boundary among these three regions physiography plays an important role as do the historico-cultural factors and administrative expediency. The Northern Aravalli is characterised by more or less level topography, fertile soil, considerable irrigation facilities and greater concentration of population, while the Central Aravalli has distinguished itself by the presence of two important urban centres (Jaipur, the State capital and Ajmer), whereas the Southern Aravalli with its rugged and hilly terrain and forest cover is rather sparsely peopled with widely scattered settlements.

The Southern Aravallis display a distinct landscape marked by undulating topography, numerous channels of streams, large uninhabited tracts and small agglomerated villages interspersed with completely scattered settlements in the areas occupied by the *edivasis* with sizeable cultivated land scattered around them. This region is further sub-divided into four third order regions : (i) the Abu block, (ii) the Mewar Hills, (iii) the Middle Mahi basin, (iv) the Banas plain (Upper).

The Abu Block (5180 km²) covers almost the whole of Sirohi district and except the western margin, it is entirely hilly. Its eastern part is crowned with Mt. Abu as an irregular plateau (about 1,300 m). It is mainly drained by the West Banas and Jawai. The normal annual rainfall is 55 cm, though Abu Road gets 125 cm, which is perhaps the rainiest area in the entire Aravalli region. The dense vegetal cover with forests, sub-tropical vergreens, especially around Mt. Abu, distinguishes it from the western margin which due to paucity of rainfall and sandy character of its soils is occupied by bush and scrub. The Abu forests have an excellent possibility for being developed into a natural park and sanctuary. They are already popular recreational ground and health centre both for Gujarat and Rajasthan.

The region is characterised by red and yellow soils of low fertility. Only 30% of the total area is under cultivation, of which 65% is under cereals. Maize, wheat, barley, oilseed and sugarcane are the other important crops. Wells are the chief source of irrigation. A cement factory based on local limestone is under construction at Abu Road. The central part of the region is well-served by rail and road transportation. The Delhi-Ahmedabad metre gauge line passes through this region. The total population of the region is 352,303 with an average density of 68 per km², which is the lowest in the entire Aravalli region. The main urban centres are Sirohi, Abu Road and Mt. Abu.

The Mewar Hills cover whole of the Udaipur district except three eastern tahsils (Mavali, Rajsamand and Vallabhnagar), south-eastern margin of Pali district and parts of Gujarat State. Situated between Banas Plain and Abu Block, it is the most distinctive hilly region covering 17,007 km². The Mewar Hills possess dual significance in the sense that firstly they have the Bhorat Plateau (1,202 m) which is the highest part of this region, and secondly, they represent the Great Indian Watershed running from north of Udaipur district to SW before turning to east beyond Udaipur city. The rainfall is moderate (50-100 cm) and about 10% of the total area is under tropical dry deciduous forests. The dense forests are in the south-east of the region where a game sanctuary is situated near Jaisamand lake.

The region has red and yellow soils in the north-west and ferruginous red soil in the southern parts. Being largely hilly and barren, only 20% of the land is under cultivation. The principal crops are maize, wheat, barley, gram and oilseeds; maize alone occupying nearly 25% of the total acreage.

The total population of the region is about 1.5 million (density: 86 persons per km²). Southern and southeastern parts of the region are generally uninhabited by the Bhil tribes. There are some uninhabited tracts and also scattered settlements with sizeable cultivated land scattered around them. Udaipur, Dungarpur, Himmatnagar, Palanpur and Nathdwara are the principal urban centres. Udaipur, (111,138 population, 1961),

the sixth largest city of Rajasthan, is described as the 'Venice of the East' for it is situated in a delightful and picturesque natural setting.

From an underdeveloped, subsistence agriculture-dominated region, it is now undergoing substantial changes in the pattern of resource-use. The establishment of Chambal sub-Grid Station, availability of substantial amount of water, occurrence of a variety of minerals, increased facilities of transportation and, above all, political patronage are transforming this region into a strong agro-industrial one. During the last seven years, a variety of industries, such as zinc, cotton, cement, etc., have been established and prospects for the future also seem to be bright enough.

The Middle Mahi Basin (7,056 km²; pop. 684,348; density 98), lying east of the Mewar Hills and south of the Banas Plain, covers Dungarpur district. The western part is hilly, the central and eastern parts, known as *Chappan*, are fertile plains with extensive cultivation based on high rainfall (100 cm).

The gradient of the Mahi and its tributaries is steep (about 8-12 m per km) and has resulted in greater erosion on the gneissic plain in the south, locally known as *Bagar*. Dry teak forests cover about 5% of total area of the region. Teak and bamboo are common species.

About 35% of the land is under cultivation with maize, rice, sugarcane and gram as important crops. The Middle Mahi Basin is a surplus agricultural region because of better agricultural production assisted by easy availability of water and fertility of soils. However, the problem of soil erosion has come to the fore. Any further attempt at deforestation in the region should be prohibited.

Being still inaccessible, the region is mainly populated by *adivasis* represented mostly by the Bhils and Gerasias. They live in small isolated hutments in the midst of cultivated patches. A sort of shifting agriculture (*walar*), formerly widespread, is now limited. Banswara (20,000 Pop. 1961) is the regional centre. Beneshwar and Galiyakot have great religious significance for Bhils and Dawoodi Bohras (a sect of the Ismaili Shia Muslims) respectively.

The Banas Plain (Upper) extends from east of the Aravalli to Malpura Upland in the east and north east. Bhilwara, Chittorgarh and three tahsils of Udaipur (Rajsamand, Mavali and Vallabhnagar) form part of it. The region (18,740 km²) is an elevated plain being drained by the Banas and its tributaries like Khari, Kothari, Berach, etc. The annual rainfall is 75 cm. The southern part of the region is moderately forested with dry teak while the northern part is sparsely covered with dry forest.

The soil is thin and stony in the west and mixed red and black in the eastern and the southern parts of the region which are extensively cultivated for maize, wheat, cotton, sugarcane, etc. About 25% of the total land is under cultivation.

The mica belt of Rajasthan passes through this region, Bhilwara (1961 Pop. 45,000) being the main centre of mica trade and industries. The region is also rich in a variety of building stones, and Nimbahera, Chittorgarh and Mandalgarh are important centres of trade for these stones.

Some industries based upon mineral and agricultural products have been established, such as cotton textile, oil, soap-stone and cement industries, between Bhilwara and Chittorgarh towns.

The region (Pop. 1,568,815; density 87 km²) has uniformly distributed, small-sized compact villages. Bhilwara, Chittorgarh and Nimbahera are important urban centres located along the Ratlam-Ajmer railway.

The Central Aravalli Region (20,919 km²) comprises of the districts of Ajmer, Jaipur and southwestern part of Tonk. The region (Pop. 2.5 millions, 1961) has a density of 123 persons per km².

The Upland, with scattered ridges in the western part, is bounded by Sambhar Basin in the west, Alwar Hills and Plains in the north, the Karauli Tableland in the east and the Banas Plain in the south. This can be further sub-divided into (i) the Merwara Hills, and (ii) the Malpura Upland.

The Merwara hills (4,400 km²; Pop. 1961: 588,983; density 130) includes the tahsils of Beawar, Ajmer and Kishangarh (Ajmer district). The Taragarh (869 m) overlooks the city of Ajmer.

The western part of the region is sandy. The normal annual rainfall is 50 cm, and the forest cover is insignificant (only 3% of the total area). Bajra, maize, barley, wheat, oil-seeds are the important crops. Wells and tanks are the main sources of irrigation.

A fairly good percentage (30%) of the working population is engaged in industries which are largely agro-mineral (cotton textiles, soapstone, cement etc). Villages are compact with a density of about 12 villages per 100 km.² About 31% of the total population is urban, with Ajmer, Beawar, Kishangarh, Nasirabad, Fushkar, Todgar, etc., as important urban centres. The region is well served by rail-road transportation and Ajmer (231,240 Pop. 1961) is the regional hub.

The Malpura Upland (16,519 km²; Pop. 1,887,403; density 117) comprises southeastern part of Ajmer, Jaipur (except Phulera, Bairath and Kotputli tahsils) and southwestern part of Tonk district. It is a flat upland which Heron recognised as a Tertiary peneplain, with 250-350 m elevation and occasional sweeps of ridges. Near Jaipur the Aravallis become prominent and most of the hill tops here are crowned with forests. Dry tropical forests cover only 3% of the area. The dark brown or black soil with a hard rocky substratum stamps the whole region. Wells are the main source of irrigation in the western and northern parts while in the south and southeastern parts tanks are predominant. The level of underground water varies between 12 and 20 m. About 50% of the area is under cultivation, 60% of which is devoted to cereals.

Villages are small-sized with a density of 20 villages per 100 km². The main urban centres are Jaipur, Saganer, Dausa, Chomu, Malpura and Todaraisingh Nagar. Jaipur (403,444; 1961), the largest city of Rajasthan is the regional centre of the area located on the Delhi-Ahmedabad metre gauge route of the western railway. Famous as the pink city of Rajasthan, it is one of the most picturesque cities of India.

The Northern Aravalli Region (24,651 Km²; 1961 Pop. 2,797,501; density 116) includes the district of Alwar and parts of Nagaur, Sikar, Jaipur and Jhunjhunu. The region can be further subdivi-

ded into the following two subdivisions of the third order : (i) The Sambhar Basin and (ii) The Alwar Hills.

The Sambhar Basin (5773 km²; 1961 Pop. 471,056; density 82) comprises the tahsils of Parbatsar and Nava of Nagaur, Phulera of Jaipur and Rupnagar of Ajmer. It occupies a depression in the Aravalli schist and gneiss at an elevation of about 360 m and all along the southwest and northwest the Aravalli spurs protect it from sand drift. The area east of Sambhar lake is flat and fertile while the western area is sandy and sterile. The main natural feature of the basin is lake Sambhar which covers an area of about 175 km². The salt basin is situated in an area of inland drainage where climatic conditions are quite favourable for manufacturing salt. The normal annual rainfall is 40-50 cm. The summer months are very hot, and average summer temperature ranges between 40°C and 45°C.

Bajra, barley, jowar are the main crops. Sambhar is the largest source of inland supply of salt in the country turning out about 8.7% of the total salt production. The region offers good promise for chemical industries. Villages are few and small-sized. Sambhar (14,139; 1961), Nava (8,097) and Phulera (9,808) are the main urban centres.

The Alwar Hills (18,878 km²; 1961 Pop. 2,326,545; density 122) cover the whole of Alwar, eastern parts of Sikar and Jhunjhunu and extreme northern part of Jaipur districts. The western and central parts of the region are covered by hills which run from north to south with an altitude ranging from 450 to 700 m and Raghunathgarh (1,051 m) is the highest point of the region. The central part of the region is dissected and fairly well wooded. The eastern part is a part of the Trans-Yamuna Plain, which is drained by the Sabi, Gambhiri and Banganga. Fertile loamy soil, high water table and a rainfall of 60 to 75 cm have made it the most densely populated area (300 persons per km²) of the Aravalli region. The soil of the western region varies from sandy to loamy and rainfall is between 40 and 60 cm. In this part *beedi* (grass-land) is notable. About 50 to 75% of the total land is under cultivation. The eastern

part is an intensively cultivated double cropped area, with bajra, wheat, barley oilseeds and sugarcane as principal crops. The villages in the eastern part are medium-sized and compact. Alwar, Rajgarh, Sikar, Neem-Ka-Thana, Kotputli, Khetri, etc. are the principal urban centres. The discovery of copper in the Udaipurwati area has helped in the industrialisation and the biggest copper smelter plant in Asia is under construction at Khetri.

The *Chambal-Sindh Basin* reflects, as is evident from the foregoing analysis, the basic unity underlying the twin basin whose major diversities lead to the recognition of three second order regions, viz., the Middle Chambal Basin, the Lower Chamber Plain and the Sindh Basin. If the focus is sharpened, finer ensembles of physical, economic, social and cultural elements provide for 9 third order regions, which bespeak their uniqueness in terms of a dominant criterion selected for regional reconstruction. For example, the Kota Plain may bear the dominant micro-morphological character, but the Harawati (Kota) Upland exhibits the cultural dominant signifying the characteristics of the region which was for long the cradle and nuclear region of the heroic Hara Rajputs. The Lower Banas Plain may not appear distinct from the Kota Plain by appellation, but the geological structure, relief and configuration, drainage, climate, soils, and natural vegetation as well as cultural elements make them distinct units in the Middle Chambal Basin.

The *Middle Chambal Basin* has a varied topography, sharply divided between lowlands and uplands. Here is spread over the net-work of the Chambal Valley Project which has initiated unprecedented economic development and social change by giving fillip to agriculture and industrialization and urbanization processes. Kota is its regional capital and has acted as a centripetal force in its regional synthesis. The region can be divided into the following four sub-regions of third order :

Kota or Harawati Upland is restricted to the southwestern part of Kota and Bundi districts. It is essentially an upland lying above 300 m. The Mukandwara Range running across from

north-west to south-east attains crest lines soaring over 510 m. Here the Chambal flows in a deep gorge. The region is strewn with boulders and forests and has little cultivated land. It has poor accessibility because of the terrain difficulties. It is a very sparsely populated region with no urban center worth the name.

Kota Plain is the most important sub-region of the Middle Chambal Basin. It is a fertile alluvial plain, well-watered by the Chambal, the Parbati, the Kali Sindh and Kural and receives about 74 cm of rainfall. Its altitude varies between 215-275 m. It is one of the intensively cultivated areas (60-70% under cultivation) because of its well-watered fertile plains. The network of the Chambal valley project canals, emanating from the Kota Barrage, are spread over the plain. It is adequately served by railways and roads. It is a moderately populated region. Kota (Pop. 120,345) has emerged as a great industrial centre. Bundi (26,478) is located at a distance of 39 km northwest of Kota. Lakheri (13,725), lying in the north, is an industrial town and has a big cement factory. Baran (22,764) in Kota district is the third largest town of the region.

Lower Banas Plain is essentially a peneplain drained by the Banas and its tributaries, the Khari, the Sodra, the Moshi, the Morel, the Berach and the Golwa. The alluvial deposits have thinner layers in north and south where hill ranges break its monotony. The Bundi Hills which have well-nigh precipitous scarps on the southern face, create impassable barriers between the Kota Plain and the Lower Banas Plain. The highest peak of the Bundi Hills (581 m) lies near Satur about 16 km west of Bundi town. In the north also the land rises to above 300 m. The region mainly has poor scrub forests. It is an important agricultural region because of good soils and irrigation facilities. It is a well-settled and moderately populated region. Tonk (43,413) is the most important town with a medieval heritage. Sawai Madhopur (20,952) is an industrial town and has an important cement factory.

Morena Plateau spreads in an elongated formation in south-eastern Morena district and extends through the tongue of Shivpuri to south-eastern

Kota district. It lies wholly above 300 m and its central ridge attains an altitude above 450 m. Its highest point (554 m) lies in Shahabad tahsil (Kota district). The dissected scarplands form its prominent geomorphological features. The region is rich in sandstones and has a forest cover over 18% of its area. Agriculturally it is of little importance and industrially too it is backward for all intents and purposes. It lacks facilities for transport and communications.

Lower Chambal Plain covers the districts of Morena, Bharatpur and Sawai Madhopur. It is predominantly a lowland with alluvial topography produced by the Chambal and the Banganga and their tributaries. The Karauli Plateau, though included in this region for the sake of convenience, has the dissected Vindhyan scarps which have a different lithological character and geological origin. The region is infested with deep ravines which provide hideouts for the dacoits. The soils are generally fertile. There is very little forest cover. Agriculturally the region is important as nearly 70% of the area is under cultivation. Industrially it is quite backward. The region has suffered heavily at the hands of droughts, famines, floods and dacoits. It can be divided into three sub-regions as follows :

Morena Plain covers the Lower Chambal Plain lying in Morena and Bharatpur districts. It is characterised by bad land topography formed by the Chambal ravines. It has fertile alluvial soils but suffers from a serious problem of soil erosion. Droughts, dearths and dacoits have spoiled its natural assets and have turned it into a problem area. Agriculture, the mainstay of its economy, is backward by all standards. Industry, except a glass factory at Dholpur, is conspicuous by its absence. The Chambal ravines have contributed to its inaccessibility which stands in its way of socio-economic progress. It is not as settled a region as is the neighbouring Bind or Bharatpur. Dholpur (27,412) is the most important town of the region with a glass factory, historic associations and wild life sanctuary. Morena (28,337) is the second largest town.

Karauli Plateau is composed of the upper Vindhyan sandstones which form a dissected scarp

land (above 300 m) overlooking the Chambal to the south. "Here the usually almost horizontal Vindhya are folded and faulted, presumably by the rigid Aravallis which are over-thrust onto them along the Boundary fault"²⁹. It presents an undulating topography strewn with boulders, blocks and depressions. The rainfall is not adequate but is well-conserved through tank irrigation. It has scanty scrub vegetation and generally poor soils. Agriculturally it is a backward region as the percentage of uncultivated area is very high, varying from 53.6% in Bari tahsil to 78% in Mandrail. Stock-raising is fairly important. It is a very sparsely populated region. Karauli (23,696) is the most important town which was formerly the seat of the Jat state of Karauli. Hindaun (20,237) is another important town of Sawai Madhopur district.

Bharatpur Plain includes the plain lying north of the Karauli Plateau in Bharatpur and Sawai Madhopur districts. It is characterised by fault-induced alluvial basin produced by the Banganga and its tributaries like the Ruparel. There are isolated hills and low ranges in the northern and southern parts. It has fertile loams but poor vegetal cover. Agriculturally it is very important as 70-75% area is cultivated. It well conserves the limited supplies of rainfall which inundates the lowlying areas during the rainy season by the *Bund* irrigation technique. Industrially it is backward. It is one of the densely populated region of the Chambal-Sindh Basin. Bharatpur (49,776) is the largest centre. It was once a very prosperous commercial town and is famous for its fort. Other important towns are Gangapur (22,591), Deeg (17,668), a historic town, Bayana (12,223) and Kaman (12,140).

Sindh Basin : It covers the districts of Morena, Gwalior and Shivpuri and acts as a wedge between the Chambal Basin and Bundelkhand. Historically it is a very important area. Topographically it is composed of lowlands and uplands which have a clear dividing line in the southern part of Gwalior district. The Sindh and its tributaries form a typical dendritic pattern. It has good soils and comparatively large percentage of forest cover. It is an important agricultural region and

has a prominent place on the industrial map of India because of the industrial complex of Gwalior. It is for most of the part well-served by transport facilities. It is sub-divided into the following two sub-regions :

Gwalior Plain covers the districts of Bhind and Gwalior and is virtually an extension of the Ganga Plain, characterised by an alluvial topography with gentle slopes towards north-east, but in its southern part there are isolated hills and the topography is rather undulating. It is watered by the Sindh and its tributaries, viz., the Fahuj, the l'arbati, the Vaisali, the Sankh, the Morar, the Sonrakha as well as the Kunwari. The Gwalior Plain is also badly affected by soil erosion which has created deep ravines. It has fertile soils and good moisture supply, hence the region is agriculturally prosperous. It has also witnessed a good progress in industrialisation. It is well served by roads and railways excepting the Bhind district. It is one of the most densely peopled region of the Chambal. Gwalior (300,587) is the largest city. It is truly the regional capital with huge concentration of industries. Bhind (28,208) is the headquarters of the district and is connected with Gwalior by rail and road. Dabra (12,661) and Gohad (10,289) are two other important towns.

Shivpuri Plateau covers the southern part of Gwalior and Shivpuri districts. It juxtaposes with the Malwa Plateau in the south and the Morena Plateau in the west. The Bundelkhand gneisses make intrusions from the eastern side. It is mostly occupied by the upper Vindhya which carry a wealth of sandstones of Kaimur, Rewa and Bhandar series. The horizontal strata suggest that the region has suffered no major diastrophic movement since the Vindhyan period. The soils are generally shallow which adds to their propensity for soil erosion. The region carries nearly 26% area under forests which are, however, of poor quality. Except for the Central Railway, the National Highway and the narrow gauge joining Shivpuri with Gwalior, the region has marked inaccessibility because of the terrain difficulties. It is a sparsely populated region. Shivpuri (28,681) is the largest centre. During Akbar's regime it was an important centre under

the jurisdiction of Narwar Sarkar. Other important towns are Kolaras (5,176) and Karera (5,025).

Problems and Prospects

Like the other parts of India and even to a greater degree, the Udaipur-Gwalior Region has multifacet problems. Comprising largely of the former princely states, the region remained physically and culturally isolated, economically undeveloped and psychologically introvert. Though much development has taken place during the last two decades or so and there have been large scale transformations, yet much is still left to be done. The facilities of road and railway transportation are insufficient even now and also not very well planned in accordance with the distribution and utilisation of resource potentials. Some of the well-known industrial and business houses of the country who belong to this region but have concentrated their energies elsewhere, are now staging a comeback with advantages accruing both to them and to the region.

This is, however, clear that for a balanced development of the region, the agricultural base has to be reinforced before other tiers of the economic structure can be built over. Agriculture will remain the bed-rock of the total economy not only as a source of employment but also of food, fodder and industrial raw materials.

The agriculture in this region is still in a depressed state not only because of the tradition-ridden attitudes of the man behind the plough who is ignorant, superstitious and fate-bounded but also because of lack of basic facilities in the form of irrigation, improved farm implements, better seeds and fertilizers, methods of pest control and better livestock breeds. The agriculture departments of the State, as also of the universities are trying to give a face-lift to agriculture in this region. The much talked about green revolution, sweeping the country is yet to be realised here. With agriculture are also associated the problems of soil erosion including ravine formations and the depleted forests. Some of the measures to improve agriculture may be as follows :

1. Introduction of proper land-use policy to put land to the best and balanced use;
2. Proper orientation of cropping patterns and cultivation of more suitable crops;
3. Extension in the area under cultivation and increase in the productive capacity of land with modern means;
4. Improvement in livestock and other associated economies;
5. Reclamation of ravines.

Small scale iron-smelting plants based on locally available ore and availability of Chamhal electric power may be established at Jaipur and Udaipur. The zinc smelter at Devari and the copper smelter at Khetri are expected to open new vistas for setting up units for such auxiliary industries as zinc sheets and strips, copper and brass pipes, tubes, sheets and circles. Jaipur, Ajmer and Udaipur areas have good prospects for the manufacturing of steel wires, industrial fasteners, machine tool accessories, electric appliances, automobile parts, scooters and motor cycles, while Gwalior and Kota can develop industries like machine tools, structurals, electric transformers, agricultural implements etc.

Among non-metallurgical industries, effective steps to set up cement factories in the private sector at Beawar, Udaipur and Nimbahera have already been taken. Neem-Ka-Thana and Abu areas also possess raw-materials for setting up cement factories. There is no dearth of resources for the development of industries based on mica in Bhilwara and Ajmer districts. Glass-sand can be utilized for the manufacture of glassware,

bottles and coloured glass at Jaipur; glass and ceramic factories can also be established at Gwalior, Kota, Bharatpur, Bundi and Sawai Madhopur, using local raw materials. The pyrite deposits near Saladipura, 35 km southwest of Neem-Ka-Thana in Sikar district and the deposits of rock-phosphate in Udaipur district are the two basic raw materials for establishing a fertilizer complex in these areas. Parbatsar tahsil of Nagaur district contains sufficient quantity of salt for the manufacture of soda ash.

With the availability of irrigation from Mahi project, there is ample scope for increasing cotton producing areas in Banswara district to feed cotton mills. Small-scale sugar factories can be established at Mandal (Bhilwara) and Khawa (Jaipur). Similarly, if more power is made available to the Sugar mills at Bhupalsagar, the bagasse which is consumed there may be utilized, along with rags and some imported pulp, for the manufacture of writing and printing paper. Bamboos, sufficiently produced in Chittorgarh and Udaipur districts, may also be utilized for this purpose. There is also scope for putting up saw mills and timber treatment plants in Udaipur and Banswara districts. Similarly, units for manufacturing packing cases and tool handles can be set up at Alwar and Chittorgarh.

Under the livestock industries, bone meal, bone glue, gelatine and superphosphate can be taken up in and around Jaipur and Udaipur. Wool processing and spinning and blanket-making unit can be set up at Malpura. A few tanneries, foot-wear factories and dairies can also be set up in the region.

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On the basis of physiography, historico-cultural relations, political background as well as geographical regional characteristics, Malwa Region forms a distinct unit ($27^{\circ}70'-25^{\circ}10' N$ and $73^{\circ}45'-79^{\circ}14' E$) lying almost in the heart of India. It has an area of 150,000 km² and a population of 12 million. The Region has a length of 530 km and a width of 390 km. The Tropic of Cancer passes almost through its middle.

It covers 18 districts of Madhya Pradesh including one fourth of Burhanpur tahsil of Khandwa, Indore and Bhopal Divisions, Guna district of Gwalior Division, Sagar district of Jabalpur Division, Banswara and Jhalawar districts and Pratabgarh and Achnera tahsils of Chittorgarh district of Rajasthan and parts of eight tahsils of Dhulia and Jalgaon districts of Maharashtra (Fig. 14.1).



Fig. 14.1

Historical Background

The word "MALAV" is a composition of two Sanskrit words "MA" and "LAV"; "MA" stands for 'The Goddess Lakshmi' and "LAV" for 'part', thus meaning that it is a part of the abode of Lakshmi, the Goddess of wealth, the designation befitting the fertile land of Malwa and Nimar. As suggested by Raj Bali Pandey, the Malvas branched off from the Malla Rashtra situated in the Gorakhpur district of Uttar Pradesh. The first derivatives from "Malla" was Mallya or Malaya which subsequently became Malava. The Malvas are referred to by Panini as Ayudhivin who lived in a tract in the north of the confluence of the Ravi and the Chenab and formed a confederacy against Alexander. Later they settled in Rajasthan and the Chambal-Narmada tract and ultimately gave their name to modern Malwa.

Early Buddhist and Jain literature, and Hindu epics like the Ramayana and Mahabharata speak highly about Malvas, the early settlers of this tract which included during the period of ancient history Avanti, Akara and Dasarna corresponding to western and eastern Malwa respectively whose boundary extended from the Mahi river in the west up to the Dhasan river in the east and roughly corresponded with the Nimar and Satpuras in the south.

"The tract was probably once occupied by the ancestors of the Bhils, Gonds, Saharias and other tribes who now inhabit the vastnesses of the Vin-dhyarange".¹ This happened due to the occasional struggle between more powerful Aryans and the aboriginals.

Some Indologists place the Narmada-Chambal civilization of Malwa as a contemporary of Indus civilization.² The banks of the Narmada also contain microliths, small flakes and implements.

During the Buddhist period the Malwa Region reached a high watermark of excellence in the field of architecture and sculpture. The Mauryas occupied the whole area up to 327 B.C. and the Sungas also ruled over most of the area. Kshatrapas appeared in the 2nd century B.C. and ruled over northern Malwa (up to the Narmada) till 57 B.C., when Vikramaditya, the great republican

leader, coming from Gardbhilla tribe, drove them out; and they again established themselves from A.D. 78 to 388. Their empire was then destroyed by Chandragupta II, who ruled over the whole tract (388-401).

With the end of Golden period of Gupta dynasty due to repeated invasions by the Huns, particularly after emperor Harsha, and by the close of 10th century A.D. a sordid political confusion took fast grip of the country and the Malwa Region passed into the hands of Parmars under the famous king Bhoj II, a scholar and a patron of literature and art, with capitals at Ujjain and Dhar.

Then started the inter-tribal contests and the incessant petty wars between various Hindu clans which made India an easy prey to the Muslim invaders. Dilawarkhan Ghori, the then Governor of Malwa, proclaimed his independence in 1401, starting the dynasty of Malwa Sultans. His son, Hoshangshah founded Hoshangabad and transferred his capital from Dhar to Mandu. Mahmud Khilji (1435-59) extended his dominion upto Ajmer in the N and Elichpur in the south.

Babar (1526-30) described Malwa as the fourth most important kingdom of Hindustan though being a part of Gujarat under Bahadurshah. Humayun defeated the king of Gujarat but Shershah (Suri Dynasty) drove him out in 1540 and appointed Shujat Khan as viceroy of Malwa. Under his regime, Akbar defeated Baz Bahadur in 1562 and Malwa thenceforth became a Moghul province (Malwa Subah) and remained so until the 18th century which period is rightly known in Indian History as a period of anarchy.³

In all the expeditions to the Deccan under the Moghuls, the routes appear to have lain through Handia and Burhanpur and Mandu and Maheshwar; with the decay of the Moghul empire Hoshangabad and Betul reverted to the Gonds, overpowered later by Marathas.

Marathas entered Malwa in 1690 and Peshwa Baji Rao, with the help of his generals and chiefs, notably Holkar, Scindia and Puar, obtained the formal grant of deputy governorship of Malwa (1743) and the Moghul hold came to an end. The decisive battle of Buxar made the Moghul em-

peror a pensioner of the East India Company and the British became the paramount power defeating Holkar and Scindia at Mahidpur (1817). The whole Malwa Agency was put under the charge of the British Resident. Sagar, Hoshangabad and Betul formed part of one province known as "Sagar and Nerbudda Territories" and lately as Central Provinces in 1861; the district of Nimar which had been under the Peshwas from 1760, was added to this province in 1864.

Though like their Muslim predecessors, the Britishers did not interfere with the social organisations of the villages in general, yet the settlement pattern was considerably modified because of continued expansion of the authority of the State, expansion and improvement of systems of transportation, communication and trade, and diffusion of Western systems.

In 1948, the states, like Indore, Bhopal etc. acceded to the Indian Union and Malwa Region was divided into Madhya Pradesh, Madhya Bharat, Mahakoshal, Bhopal—now in M.P., and Jhalawar, Banswara, and Pratabgarh in Rajasthan and parts of eight tahsils of W. and E. Khandesh of Bombay Presidency in Bombay (Maharashtra).

Again in 1956, when the States were reorganised the Malwa region came under Madhya Pradesh, Rajasthan and Maharashtra.

The Physical Setting

Geology

Malwa Region, lying in the northernmost part of the Peninsula, inherits a complex geology. Scarcely any one of the peninsular groups is unrepresented here.

Bundelkhand gneisses are found in the north-eastern part of Sagar district unconformably overlain by the Bijawars and the Vindhyan which occupy large areas of Malwa Region north of Budni. This was followed by the basaltic overflows after a long gap.

Archaeans are also found in Jobat, Bagh and Dhar Forest areas. Some very small inliers of Bijawar rocks are seen in the Deccan Trap of Nimar.

The *Vindhyan*s extend from Neemuch eastward to Sagar and from Jobat beneath the traps

towards east, merging with the Kaimur and having exposures in Bhanpura, Jhalrapatan, Jobat, Bhopal and Sagar. The Cuddapahs were succeeded by the Vindhyan system after a time interval marked by earth movements and erosion. The Vindhyan have been deposited on older peneplaned surfaces and there are evidences of semi-contemporaneous earth movements. In the area between Chittor and Hoshangabad the compressive forces have acted from the south-west and west. In the Dhar Forest area and near Jhalrapatan the Vindhyan are folded and show steep dips. The margins of the Vindhyan basin show a good development of sandstones while shales are best developed in the centre and the east, passing gradually into sandstones.⁴

The most striking feature formed by the Vindhyan rocks is the scarp which marks the northern flank of the Narmada—Son Valleys; in the west this is largely formed of the Deccan Lavas, but Vindhyan rocks occur between Bhopal and Itarsi.⁵

The *Gondwana* rocks of the Satpura region occupy the hilly country of southern Hoshangabad. There is a prevalent dip of the rocks of the Satpura *Gondwanas* towards the north, the lowest beds being exposed chiefly near the southern boundary; on the east the tract is overlain by the Deccan Trap and the Narmada alluvium. Trap dykes abound throughout the whole Satpura area, many of them being of large size.

The rift or fault which seems to have induced the Narmada Valley was of considerably later date than the bulk of the faulting which took place during the *Gondwana* and produced a river flowing westward. The valley deposits are of Cretaceous or of later period.⁶ Here in the Valley the presence of dykes, in Mimar and Dhar districts, in a belt of 18 km both in the north and south of the Narmada extending east-west with convex side towards north do speak about forces of eruption coming from the south.

The *Deccan Lavas* are generally 600-1,500 m thick (maximum 3,000m) and cover a vast area with their mesa-like terrain. "These practically horizontal and remarkably homogeneous basalts were probably extruded from fissures towards the end of the Cretaceous, though a flora which seems

to be of early Eocene age is found between some of the flows. The lavas were poured out on to a land surface which had already attained an advanced stage of maturity, and form a most striking feature in the geomorphology of the Peninsula.⁷⁷ The basalt rocks are uniform over wide area in Malwa Region. They weather with spheroidal exfoliation and give rise to rounded boulders, a common feature of the region.

Physiography

The Region falls into the following well-marked physiographic units : (i) Malwa Plateau, (ii) W. Vindhya, (iii) W. Narmada Trough and (iv) W. Satpuras (Fig. 14.2).

The Malwa Plateau is enclosed in the west by the Vindhyan Range and its offshoots running

from the western margin near Machhlya Ghat in Jhabua district to Pratargarh merging with the Aravallis; in the north, by the Mukundwara Range and its continuations, although having breaks and wide openings made by the north flowing rivers, joining the eastern offshoots extending from Bhopal to Guna. Sagar Plateau in the east and Rath Bagar in S. W. and west form transitional zones culturally but are one compact unit physiographically.

To the north of the Vindhya Range lies a wide expanse of lava landscape overlying a pre-Cretaceous surface. Its general elevation is 500-600 m. Erosion has succeeded during Tertiary times in carving out an extensive level surface over the pile of lavas, drained by the headwaters of the Mahi, Chambal, Kali Sindh, Parbati, Betwa and

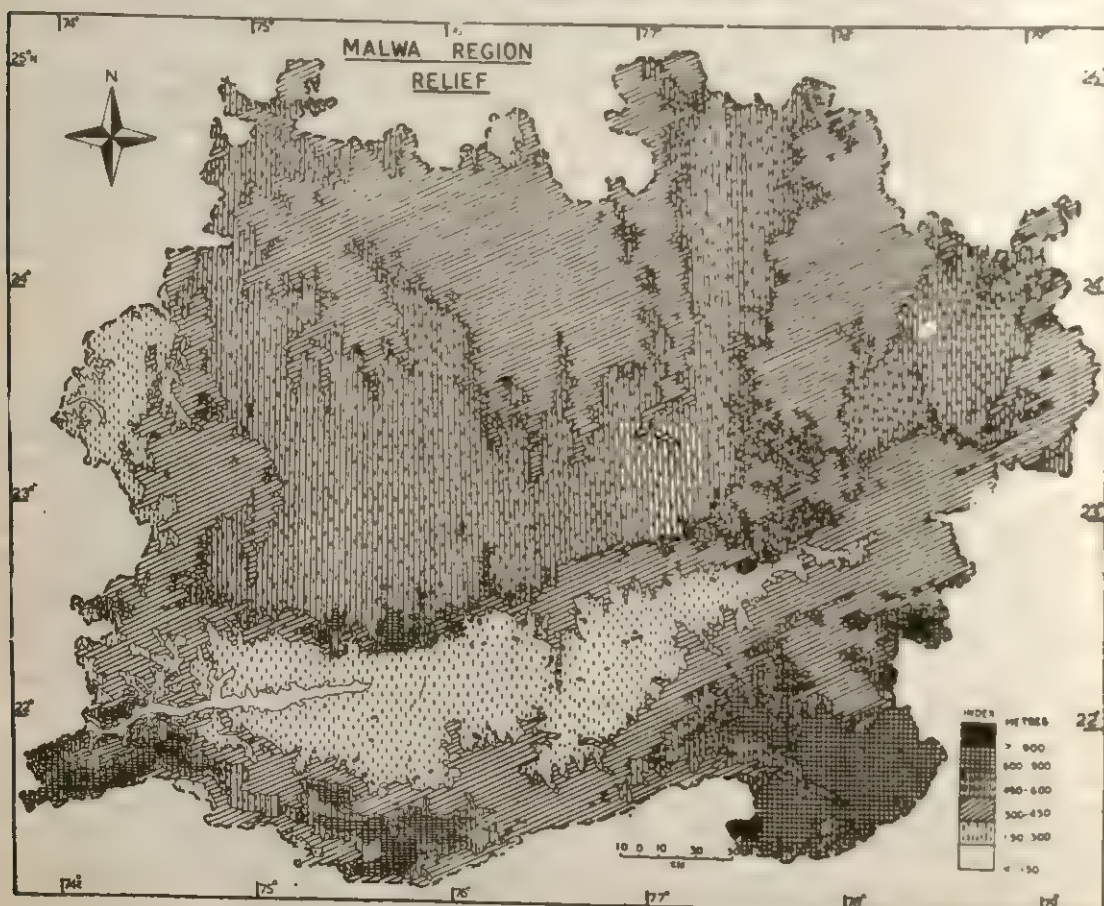


Fig. 14.2

Dhasan, with gently undulating divides. Most of these river valleys are flanked by terraced slopes; the paired terraces of the Kali Sindh between Sonkatchh and Sarangpur—a distance of about 70 km, are typical examples. The eastern part of the plateau presents a different landscape. Here to the east of Bhopal city the Vindhyan sandstones are found in juxtaposition with the Trap in an irregular fashion. These indicate that the trap was poured out upon a very uneven surface of the pre-Cretaceous age.

The younger trap hills are invariably lower in elevation because of rapid weathering of basaltic lava. The resurrected sandstone hills are higher, craggy and steep-sided, though they are often *cuesta*-shaped. Isolated mesas, rounded or linear, occur practically everywhere on the Malwa Plateau, whereas it is only in Bhopal and Vidisha that one comes across the sandstone hills.

The *Western Vindhyas* is really an escarpment which varies in character and height depending on its structure and lithology. For the first 100 km from its western terminus, Gomanpur peak (554 m) in the Dhar district of M.P., the Vindhya Range runs in a curve, its convex side facing the Narmada Valley. From Gomanpur peak broad spurs descend southwards giving rise to Bagh Hills. General elevation of this scarp varies from 450 m to 600 m though a few points rise above 800 m, Janpao and Singarchori (884 m) being noteworthy.

For the next 160 km a more open type of country prevails and the basaltic escarpment becomes more prominent near Hoshangabad, the rock type changes, the Vindhya Range comes down very close to the Narmada river and presents a terraced slope built of hard sandstones alternating with shales. In the east, the Vindhya Range merges with the Bhanter Hills.

This whole range lying in Malwa Region forms the Faripatra upto Bhopal and Rksa (both mentioned in Puranas) eastward.

W. Narmada Trough: From Udaipura upto Kukshi this graben is a tract of fertile land and has been a cradle of old civilization. The Narmada Valley which has a variable longitudinal slope is not one continuous plain but is broken

up into parts separated by hills. From Udaipura down to Handia the great Hoshangabad Plain has a slope of only 1/2700 and closely coincides with the younger alluvium. Just below Handia there are a number of quartzite hills and beyond these the Narmada flows through a gorge (the Mandhata gorge) carved out of Vindhyan sandstones.

North of the Narmada and lying between Handia and Barwaha is the Dhar Upland, a hilly and forested area. Downwards the descent is rather steeper and in the middle of Nimar Plain is located the 8 m high Sahasradhara falls. While the Mahis-mati or Nimar Plain generally lies below 300 m of elevation, above this height lies the Nimar Upland stretching east to west in the north of the Satpuras. Further westwards and separating the Nimar Plain from Broach-Baroda Plain is the hilly tract of Mathwar and Akrani, both separated by the steep Narmada gorge.

The *Western Satpuras* separate the Narmada and the Tapti river basins. From their western termination in the Rajpipla Hills as far as the borders of Betul the dips are low and irregular and have no marked connection with the direction of the range.⁸ This western part is composed mainly of Deccan Traps and is arcuate in form, 20-40 km in width, with many peaks rising above 900 m, such as the Toran Mal (1,150 m) and Astamba Dongar (1,325 m). The trappean beds are slightly tilted here and the block is traversed by a large number of dykes.

East of Asirgarh is the Burhanpur gap through which flows the Tapti. Beyond this gap lies the Central Satpuras (Mahadeo Hills) over-looking the Narmada trough northwards but cutoff to the south by a stupendous line of cliffs. The important formations are of Talchir, Barakar and Bijori stages of which Barakars are the coal-bearing beds.

The Pachmarhi stage of rocks form a magnificent scarp above which Pachmarhi town is located. Southwest of Pachmarhi is Dhupgarh (1,350), the highest peak in the Satpura Range. The Upper Gondwana sandstones of the Mahadev series on weathering take peculiar forms resembling bastions, buttresses and battlements and are cut by deep canyons.

Drainage

The Malwa Region has two systems of drainage, one of the Arabian Sea with the Narmada, Tapi and Mahi—the former two flowing through tectonic rifts, and the other of the Bay of Bengal with the Chambal and the Betwa joining the Yamuna.

The Narmada (The Namados of Ptolemy and the Reva of the Puranas) flows through an asymmetrical valley enclosed between the Vindhya on the north and Satpuras on the south. The river flows through the undulating plain of Hoshangabad, about 300 m high, dotted with occasional low buttes, where it is joined by the Tawa coming from the south. Near Handia the river leaves the alluvial plain and flowing westward through the Mandhata

gorge develops rapids or falls, the Dhardi falls (15 m) deserves mention. On emerging from Dhar Upland it flows almost in a straight course for a distance of 130 km through the Mahismati Plain. The river enters again a narrow gorge at Murakta between trap formations rising to over 1,000 m in Akrani Hills and flows as a superposed river for 120 km. It receives numerous tributaries from the Vindhya and Satpura ranges causing floods in the Valley (Fig. 14.3 and 4).

The Tapi (Tapi) rises from Betul Plateau of the Satpuras and flows westwards through a rocky gorge in the hills and enters the Burhanpur-Jalgaon Plain in Maharashtra region.

The Mahi (the Mophis of Ptolemy and Mais of the Periplus and Manorama of the Puranas) rises in the Dhar district at 617 m elevation and flows for about 160 km through M.P. develop-

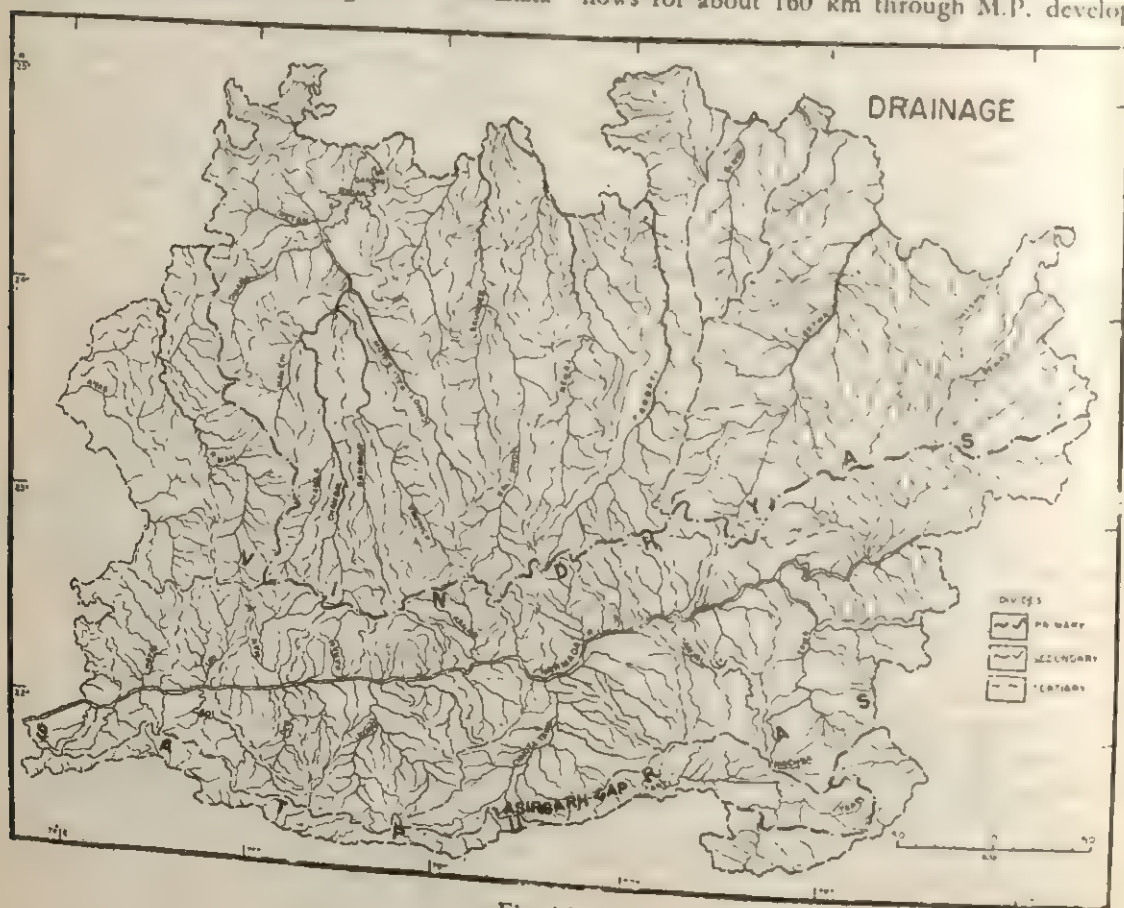


Fig. 14.3

DRAINAGE PATTERN & STREAM TYPES DYKE & DRAINAGE

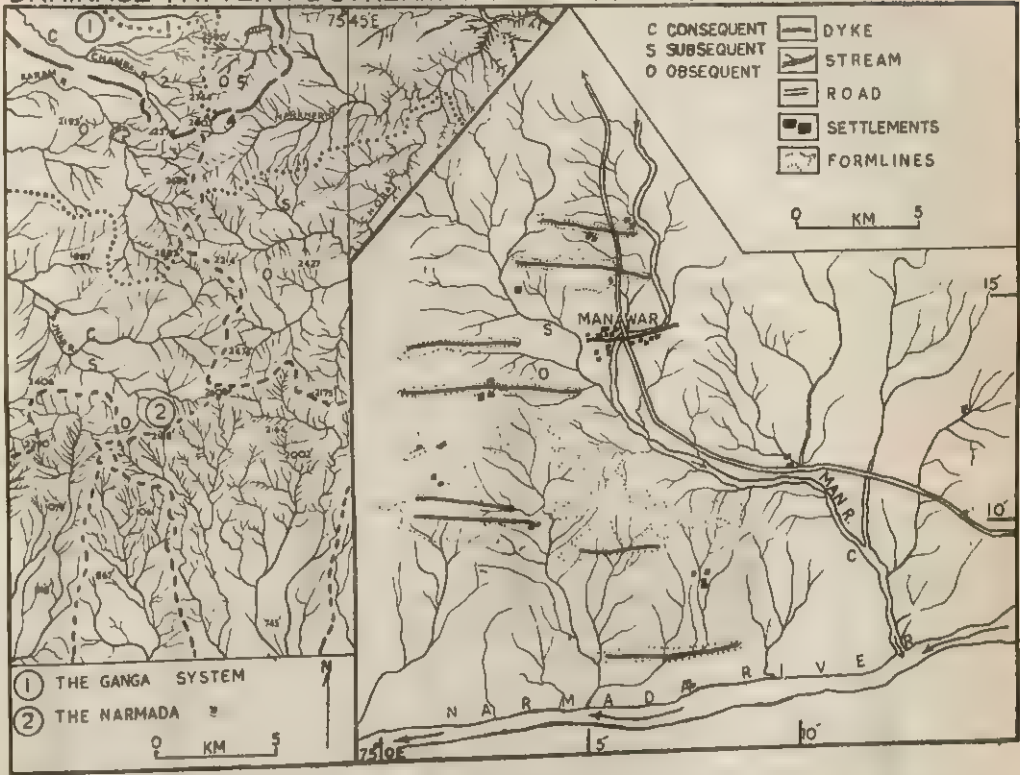


Fig. 14.4

ing ravines in its basin. Flowing towards west and north-west it reaches Dungarpur border where it is deflected by the Mewar Hills to the south-west and the rest of its course in Malwa Region forms the boundary between Dungarpur and Banswara districts. Its main tributary from the left is the Anas. The river is well-known for its high banks, the fierceness of its floods and deep ravines.⁹

The *Chambal* (the Charmanavati of the Puranas) rises from the northern flanks of the Vindhyan scarps (Janpa 884 m) near Manpur in Indore district. For about 325 km it runs through a gorge. The river falls from 884 m at its source to 505 m near Chaurasigarh in the Mandsaur district where it borders Rajasthan and winds through a wide bowl like basin and enters into a long and narrow gorge utilized for dam site of Gandhi Sagar of the Chambal Valley Project.

Its left bank tributaries are the Chambal and Retam while from the right unite the Gambhir, Kshipra, Chhoti Kali Sindh, Kali Sindh, Newaj, Parwan and Parbati—all flowing northward.

The *Betwa* (the Vetravati of the Puranas) rises from the Vindhyas near Ubaidullaganj in Raisen district and flowing through Sanchi, Vidisha, Kurwai in a north-easterly direction turns northward and forming boundary between Guna and Jhansi districts enters into the Bundelkhand Region. It flows through the Vindhyas in its upper reaches and through granite uplands further down.

The *Sind* rises at Hatoli on the plateau west of Sironj and flows northward through Lateri and Guna into the Gwalior Region.

The *Dhasan* (Dasarna of the Puranas) rises from the Sagar Plateau and flows north-eastward marking boundary between Jhansi and Sagar districts.

Climate

The main factors in the climate of Malwa Region are its latitudinal location giving fairly high temperatures throughout the year and altitudinal variation introducing significant variations in the rainfall. The climate in general is tropical Monsoon type (Fig. 14.5).

Climate on the whole is healthy and the elevated plateau is notable for its cool nights in the

hot season. The two parallel ranges of the Vindhyas and Satpuras have marked effect on the climate of the region, the most pronounced being the westerly direction which they give to the wind. The climate is characterised by a hot and dry summer except during the southwest monsoon season. The year falls into three characteristic seasons, viz. the cold season (Oct.-Feb.), the hot weather (March-June) and the rainy season (July-Sept.).

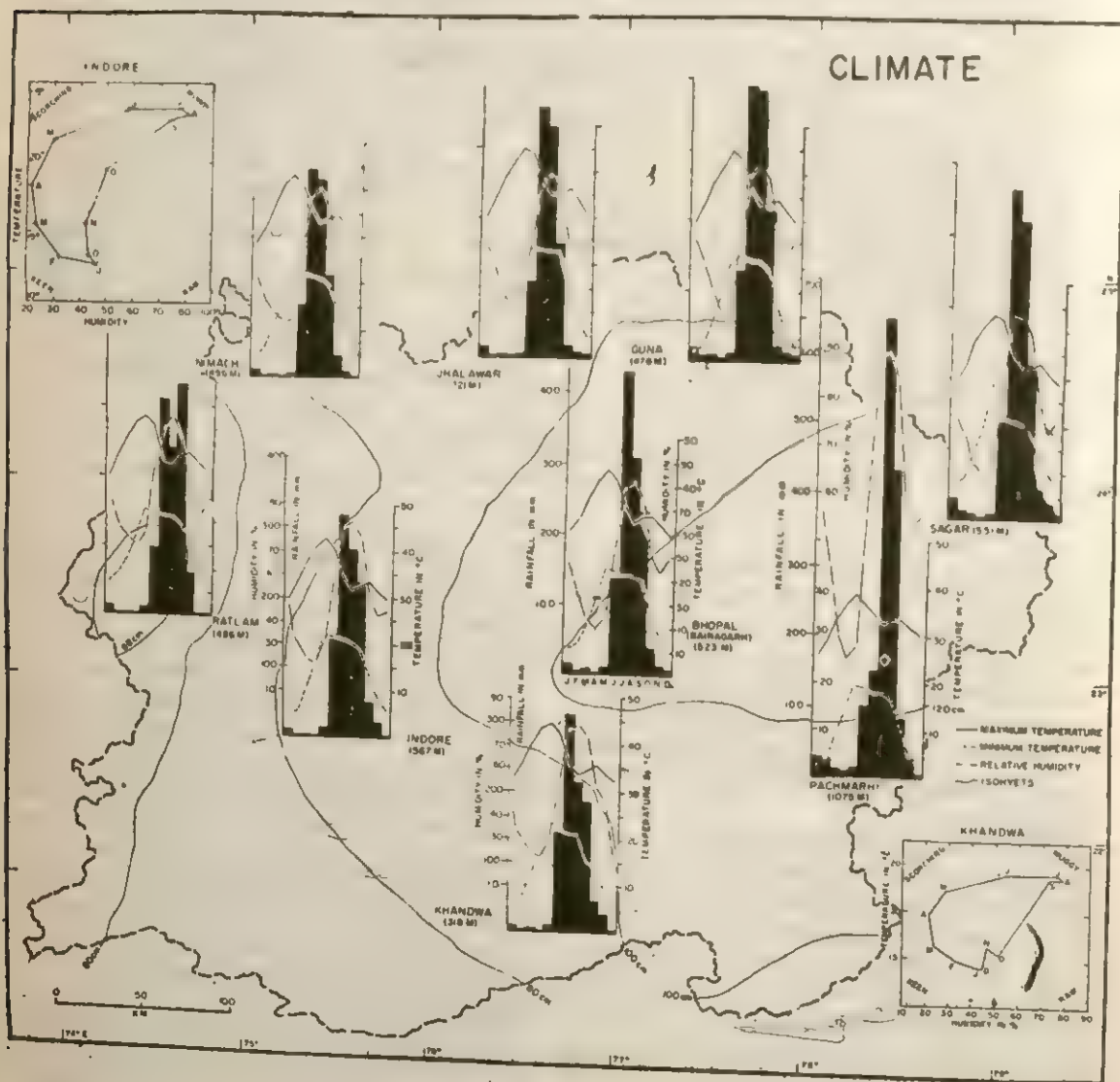


Fig. 14.5

Temperature starts rising from February but the rise is appreciable in March (4° - 5°C) and continues till May, the hottest month throughout the region, and when occasionally very high temperatures (45.6°C at Bhopal on 22-5-47) accompanied by the heat waves are also experienced. Irrespective of altitude, the cumulative increase in average monthly temperature between January and May is almost uniform (around 15°C). During May the temperature spatially varies from 29.6°C (Pachmarhi) to about 35°C (Jhalawar) with the diurnal range of about 15°C . With the outburst of Monsoon in June a fall of about 8°C in average monthly temperature is noted till September. Following the withdrawal of Monsoon it again experiences slight upward trend (Fig. 14.5) which continues in the day temperatures of even October, though the relatively cooler nights keep the average low. During the rainy season the temperature varies from 33.15°C (June) to 25.9°C (August) on the Malwa Plateau while on the Mahadeo Hills it remains between 26.6° - 21.6°C , with diurnal ranges seldom exceeding 10°C . The temperature begins to fall again from October and continues till December, which marks the coldest month on an average with average temperatures ranging between 14.75°C (Pachmarhi) and 18.1°C (Bhopal), though occasional lowest temperatures associated with cold wave are experienced in January (Bhopal 0.6°C on 18-1-'38 and Pachmarhi -1.1°C on 16-1-1935). A significant feature of the daily winter temperature is its higher range (16°C over the Plateau and 17.3°C in the Narmada Valley).

The average annual rainfall is about 106 cm varying from 8 cm in the west to 202 cm in the east. The western districts of Jhabua, Ratlam, Jhalawar, Neemuch, Dhar, Shajapur, Ujjain, Indore, W. and E. Nimar and Banswara receive 80-100 cm rainfall while eastwards Hoshangabad (115), Sagar (117) and Bhopal (126) experience higher rainfall, the maximum being at Pachmarhi (212). The rainiest months are July-September; the monsoon gives over 90% of the annual total. During post and premonsoon periods it varies from 3 to 7 cm.

Except during the monsoon months the atmosphere is generally dry, afternoons being drier

than the mornings. In the post-monsoon and winter months relative humidity ranges between 20-40% in the afternoon, while in the summer months it is still lower (10-15%).

In the summer and monsoon months winds are strong. During the monsoon they blow mainly from SW and NW. In the post monsoon and winter months, morning winds are light and are mainly easterly or north-easterly. In the afternoons wind steers between south-west and north-west through west. Dust-storms occasionally occur during the summer season. Fog occurs very occasionally in the post-monsoon season, though Pachmarhi experiences 29 days of fog during July-August.

Soils

The black soil occupies almost the whole region. It varies in depth and is usually loamy to clayey in texture. Lime concretion zone and free calcium carbonate are invariably present at different depths. Cracks develop in summer season and in deep clayey soil they are even a metre or more deep. This soil is usually ill supplied with phosphate, nitrogen and organic matter but is sufficient in potash and lime and is suitable for cotton, jowar, wheat, sugarcane, groundnut etc.

So far as chemical composition of black cotton soil is concerned, 84% soils indicate high percentage of potassium, 54.5% are high in phosphorus, while 81% soils are low to medium in nitrogen, phosphoric acid and organic matter, but potash, lime and iron contents are usually high. The nitrogen content of *regur* soil is very low (0.02 to 0.05%), while phosphoric acid (0.08 to 0.2%), potash (0.8 to 0.15%) and lime (1.0 to 7.7%) also vary. This soil has three sub-types: (i) Deep black soil, (ii) Medium black soil and (iii) Shallow black soil.

Deep Black Soil covers major part of the Narmada Valley and the open and level portions of Vindhya and Satpura plateaus especially in the area of Hoshangabad. This soil may be further subdivided as black, dark brown, coarse brown, mixed and sandy. The highly productive black soils in this part are known as *Mariar* and *Kabar*.

I. They have clay content of 50-60% and a cal-

cum carbonate percentage of 0.45. The pH ranges from 7 to 7.5.

Medium Black Soil covers major portion of the region including Sagar, Nimar, Raisen, Sehore etc. and is suitable for most crops. The soils of Sagar, Mandasaur, and Shajapur contain 20-40% clay while in Vidisha, Guna, Indore, Dhar, Ujjain and Dewas districts it varies from 30 to 35%. *Morand* soil of Hoshangabad is characterised by the presence of small limestone pebbles and has a deposition of calcium carbonate in the lower layers. It is more gritty and friable than *Kabar*.

Shallow Black Soil is primarily spread over the region of Satpura Ridge and Betul, Jhabua, Jhalwar, W. Ratlam, Mandasaur and Banswara. It consists of shallow loams having 15-30% clay. The important types are dark brown clay, loamy rice soil, black soil and poor light hilly soil.

Mixed Red and Black Soil is found in the western part of Guna, Jhalawar and Shajapur. The major characteristics are light texture and absence of lime concretions and free carbonates. The commonest form of this soil is a sandy clay and it differs greatly in depth and fertility and produces large variety of crops under irrigation. It is generally deficient in nitrogen, phosphoric acid, organic matter and lime.

Red and Yellow Soil is generally light and sandy, though the medium and heavy varieties are also present. It is poor in phosphoric acid, humus and nitrogen.

Skeletal or Gravelly Soil consists of stony uplands of the Vindhya and Satpura Ranges, particularly in Jhabua district. It usually grows inferior millets and oilseeds.

Sandy soils called *Domatta* and *Retari* are found along streams and on higher grounds suitable for Kharif crops.

Alluvial soils occur only in river valleys of the Chambal, Betwa, Kali Sindh, Parbati, Kshipra and Mahi. Pendleton has mentioned the soils of Mandasaur and Ujjain districts at places as Kshipra clay-loam and Malwa clay-loam.

Forests

At its best the flora in this region is of Savanna type on the plateau and moist deciduous in the

southern part. According to Champion, forests in the northern part belong to drier deciduous type grading into open thorny scrubs. Forests are of three types based on their occurrence : (i) Hill forests, (ii) Stream forests and (iii) Plateau forests. *Hill Forests* are found on higher altitudes of the Vindhyas and Satpuras having teak associated with Saj, Haldu, Tinsa, Salai, Sal etc. These are mostly reserved forests. *Stream Forests* appear in strips along the rivers and rivulets consisting of date palm, *Babul*, *Neem*, *Albina*, *Harra*, Tamarind, *Jamun*, *Karanja* etc. *Plateau Forests* consist of mainly *Dhak* and thorny bushes found on higher terraces.

The forests are concentrated mostly in the districts of the Vindhyan and Satpura areas such as Hoshangabad (37%) E. Nimar (49), W. Nimar (37), Raisen (41), and Dewas (31); Vidisha (8.1), Ratlam (8.9), Banswara (15.1) and Jhalawar (2.8) are sparsely forested.

Amongst the commercially exploitable forest trees teak is the most outstanding and covers mainly the Vindhyan and Satpura Ranges. Other economically important forest products include lac, dyeing and tanning materials, gums, fruits, *sabai* grass and honey etc.

Teak mainly occurs in the forests of Hoshangabad, Betul, E. Nimar and Dhar (Upland), Sagar, Indore, Guna, Jhalawar and Sehore. The tree attains good size over trap areas but avoids the Gondwanas. The *Bari* teak of the Hoshangabad forests is well known for the quality of its timber. It is often associated with other species.

Mixed deciduous forests occupy large areas in Hoshangabad, Nimar and Banswara. Most of the tree species of commercial significance are found here. Several species are converted into charcoal which is an important commercial product of the region.

Bamboo occurs as an understorey in most of the teak forests of Hoshangabad, Betul, Guna, Kharagone, Dhar, Dewas and Sehore districts. Dwarf variety of bamboo is found on slopes in Banswara.

Minerals

A variety of mineral deposits is found in the region including amongst others coal, manga-

nese ore and mica. There are extensive deposits of coal near Shahpura in the Tawa Valley (Betul having four seams). They vary in thickness from 1-3m. The Pathketa coalfield (Betul) contains three seams; reserves are estimated at 21.9 million tonnes with bands and 16.8 million tonnes without bands.¹⁰ The Hoshangabad reserves are 4 million tonnes (Fig. 14.6).

Iron ore is found in the districts of Dhar, Jhabua, E. Nimar, West Nimar, Banswara and Jhalawar. Iron has also been reported in the Silwani tahsil of Raichur. It is found in ferruginous lateritic cappings, Bijawars and the Vindhyan. The lateritic iron ore of Berasia in Bhopal contains high metal content.

Manganese deposits are located in Jhabua, west Nimar and Banswara. Banswara and Udai-

pura have 4 million tonnes of manganese as reserves. Mica is found in Jhabua in large quantities. Copper ore deposits exist in Dewas, Hoshangabad, Banswara and Jhalawar. Bauxite in the form of laterite covers large parts of Guna and Vidisha districts. Similar laterites have also been observed in Rajgarh, Sehore, Shajapur, Ujjain and Mandsaur districts. It is estimated that at least 80,000 tons of good quality bauxite occurs in this region.

Jhabua district has some workable deposits of asbestos near Jobat town. Among other non-metallic deposits, the limestone occurrences of Jhabua, Dhar, West Nimar, Guna and Mandsaur and the clays of Jhabua may be mentioned. Marble has been reported in the Hoshangabad district. Calcite of Jhabua is important. Soap-



Fig. 14.6

stone and lead-zinc ore deposits have been reported in Banswara and graphite in Betul. Vindhyan sandstones and the basaltic rocks serve as building materials.

Water Resources

With a large catchment area of over 98,000 km², an ample rainfall in the east and a sufficient gradient from 1,050 m down to sea level over a distance of only 1,300 km, the Narmada basin provides for a large power potential as well as water for irrigation. The various projects in the Narmada Valley may irrigate about 3.9 million acres and give 453 MW of power.

The Chambal Valley Development Scheme drawn up by the two States of M.P. and Rajasthan has envisaged the construction of three dams. With the completion of the Gandhi Sagar Power Station (1960), power is being delivered in bulk at several grid sub-stations such as Ujjain, Nagda, Ratlam, Indore, Bhopal, Neemuch etc.

Mahi Project consists of the construction of a masonry dam across the river Mahi and a canal system to provide irrigation to 76,000 acres in Banswara district. Other projects are associated with the Kali Sindh, Parwan and Bhim Sagar in Jhalawar and Sarwaria in Banswara.

There are 22 other irrigation projects also such as those on the Tawa in Hoshangabad, Morwan in Mandsaur, Bila in Sagar, Pingla Nala in Ratlam, Choral in Indore and the Barna in Bhopal. Some village projects are also of local significance.

Physical Resource Base

The region derives its resource base from the rich fertile trap soils, forests, minerals (of limited significance) and water resources. Endowed with vast fertile, well-drained land with one of the richest soil cover, a year-round growing season and adequate rainfall, the region can grow a variety of food and industrial crops with the aid of supplemental groundwater and surface water resources to be stored and channelized in the rain deficient months or seasons.

The region has from times immemorial developed an indigenous system of tapping the water resources through wells, tanks and reservoirs. Now the huge potential of big rivers like the

Narmada, the Chambal, the Mahi, and the Betwa, when dammed and utilized for generating power, may pave the way for economic growth of the region.

Likewise, the vast forest resources, particularly on the Vindhya and Satpuras, supply timber, forest produce, fuel and fodder. Teak and Sal in the Vindhya and Satpuras may well be utilized for industrial development. Itarsi, Hoshangabad, Dhamnod and Sagar have already been developed as important timber centres. The main supply of timber, including tinsa and linja, is from Sehore, Indore, Guna, Dewas, Jhalawar, Banswara, Raisen, Nimars and Hoshangabad. Bamboo is obtained from several districts. Dyeing and tanning substances such as harra, baharra, amla, bark of acacia are notable which may also be used for medicinal purposes. Mahua flower and seed are utilized for producing alcohol and oil.

The Cultural Setting

It is one of the sparsely peopled regions of India with a density of 81 per km² though more than the States' average (73). Density of Indore division (84) is higher than that of Bhopal (67). Highest density, on district level is found in Indore (197) followed by Ratlam and Ujjain (108). Tahsils of Indore, Ujjain, Ratlam, Mhow, Huzur, Kharagone, Dewas, Barwani, Neemuch, Sendhwa all have higher density varying from 101 (Khandwa) to 499 (Indore) due to urbanization. Low densities (less than 70) are due to ruggedness of terrain and poor soil (Fig. 14.7).

Thus densely settled areas are in Hoshangabad, Manawar, Kasarwad, Rajpur in Southern Malwa region and Dhar Mhow, Shajapur, Ujjain, Ratlam, Jhalrapatan and Kushalgarh in Malwa plateau area. The escarpment of the Vindhya and forested slopes of Satpuras are largely empty.

Growth of Population has not been uniform. The 1901-11 decade witnessed spectacular growth (15.78%). The main reason was the relative immunity from famines and epidemics. During the second decade (1911-21) the population increased by 2.30% only mainly due to influenza epidemic; some of the districts registered a

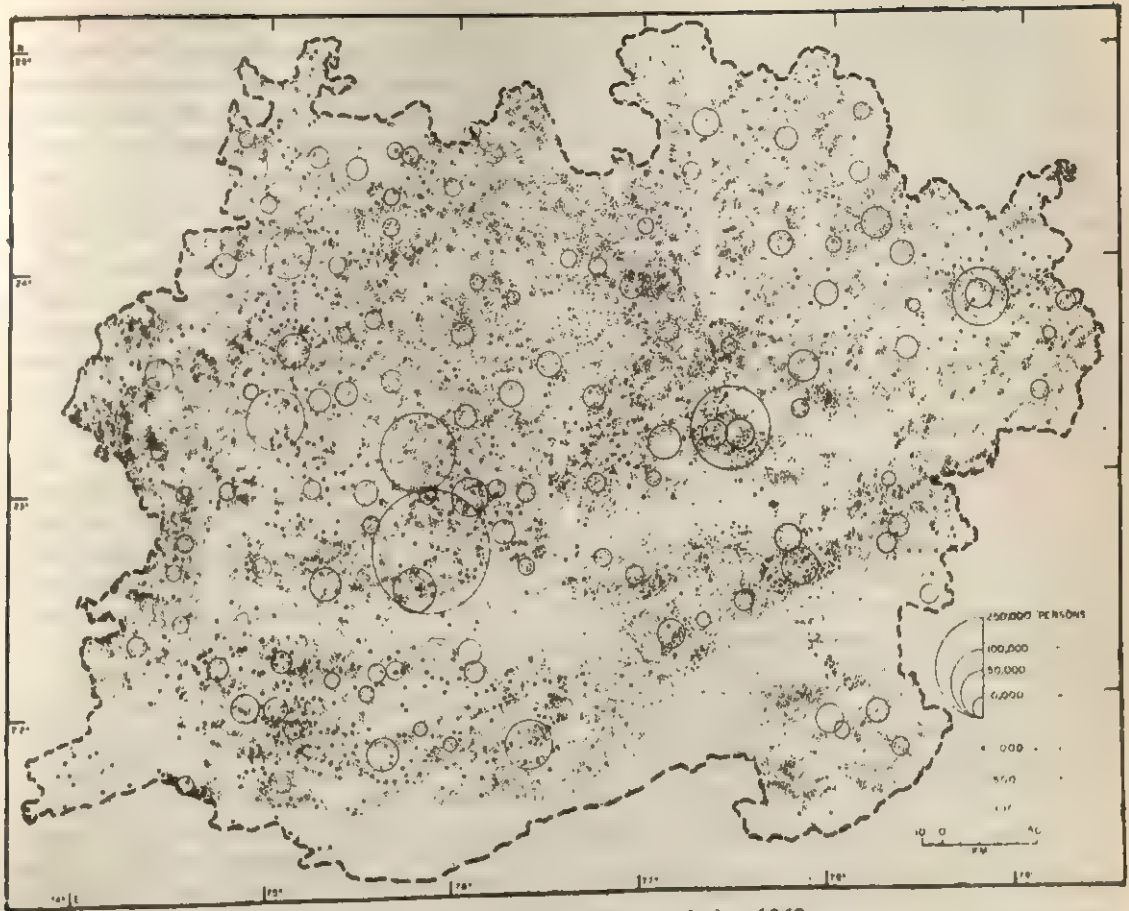


Fig. 14.7 : Distribution of Population 1962

decline. During 1921-31, however, the region recorded a moderate rise (11.65%) which continued with somewhat lower rate upto 1951. This slow growth rate is mainly due to lack of economic development. The next decade (1951-61) showed a higher increase (27.5%) which was more than the average for south Malwa region (19.3%). The main factors were new developments in industry and transport, establishment of new colonies, immigration and territorial adjustments with Rajasthan. The projected population for 1971 and 1981 is estimated at 16.28 and 21.09 million respectively.

There are about 927 females per thousand males in the region. However, there is greater imbalance in rural (935) and urban (735) sex ratio. The lower

female ratio in both rural and urban areas may be ascribed to high incidence of female mortality.

Children (0-14 years) comprise about 42% of the population, adolescents and young (15-59) about 53% and old people about 5%.

Females have lower percentages of literacy and education than males in both the rural and urban areas. In urban areas it varies from about 51% in Indore to about 34% in Rajgarh.

Rural-Urban Ratio : Less than one-fifth of the population is urban with wide sub-regional variations. In Bhopal Division it is 16 and in Indore 24; on district level variation is still great ranging from less than 5 in Raisen to 60 in Indore. Urban percentage is above 20 in Indore, Sehore, Ujjain, Ratlam, Khandawa, Sagar and Mandsaur.

In the rural areas working population is about 54% while in urban areas it is only 33.84%. The percentage of active workers engaged in agricultural activities is as high as 79% against 83% in M.P. Of the working population, 61.2% are engaged in cultivation, 12.9% as agricultural labour, 4.36% in household industry, 3.55% in manufacturing industry, 1.18% in construction, 3.47% in trade and commerce, 1.13% in transport, storage and communications and 9.45% in other services.

Already the number of persons dependent on the land is much greater than the number it can support; agriculture being the receptacle of all kinds of unemployed and under-employed persons has been tragically overburdened.

Rural Settlements

Over 81% of the population is rural living in about 27,950 villages of different sizes; 41.5% of this resides in very small villages (less than 200 persons). There has been a decrease in the per-



Fig. 14.8 : A. Scattered. B. Compact to sprinkled.
C. Compact. D. Semi-compact

centage of population living in small villages (population below 500) in all the districts of the region, and increase in all the districts in villages of medium size (500-999) while large-size villages have made gains in Indore, Ujjain, Shajapur and Rajgarh. Still larger villages (5,000-9,999) have gained only in Schore, Betul and Indore districts.

The compact villages are widespread over the whole region varying from 100-5,000 in population and a few over 5,000-10,000. They are mostly water-point villages e.g., Dharad in Ratlam, Datana in Ujjain, Rustampur in Khandawa, Dhamnod in Dhar, Shampur in Schore, Baman-kheri in Dewas. Semi-compact villages are found mostly in Malwa Plateau area east of the Kshipra, in Rajgarh, Guna, Mchidpur, Sarangpur, Manawar, Mhow, Narsingarh, Jaora and Garhi. *Semi-sprinkled* or hamleted type settlements are located in areas with dissected relief. Matkuli in Hoshangabad, Dedula in Manawar (Dhar) are examples in point. Most of the tribal settlements in rugged and inaccessible terrain are of sprinkled type; even homesteads and isolated huts are met with.

Compact settlements are mostly situated near water bodies, but in the Vindhyan and Archaean pockets these are on hill tops, one or two km away from streams or tanks. Market-villages have grown along routes at favourable points such as Meghnagar, Gandhwani, Amjhera, Bercha, Maksi, Shampur etc. During medieval period, generally, hill tops or high bluffs of river meanders provided defensive sites for compact settlement Patan, Meghnagar, Raghogarh, Mandu etc., may be cited as examples of fortified villages (Figs. 14.8 and 14.9).

The ground plan or design of Malwa villages shows some common patterns, though majority of the villages are unplanned. Villages with some dominant nuclei have generally oval or circular patterns; temples, *haveli* or *garbi* (residence of landlord or a fortress) formed such nuclei. Some villages along roads, railway or streams have developed in a linear or ribbon pattern. A large village located in the midst of productive land develops rectangular pattern with two roads

intersecting at right angles. Such villages are common on the Plateau and in the Narmada valley.

Three types of rural dwellings are found. The poor tribal wattle huts are thatched or tiled. The average size cultivator's house has one to two or three rooms. The landlords have spacious houses; with some exception, dwellings are mostly roofed with semi circular tiles or straw and reeds. The walls are made of mud and are plastered with yellow clay. A few houses are roofed with corrugated iron sheets and are brick walled. Majority of houses have one to two or three small rooms with a yard at the back for animal shed and store room for grass and fuel.

Sample Village Bhugore: The village (23°23'N 76°42'E; 1970 Est. Pop. 542) lies in the middle of the Malwa Plateau Region, 2 km east of Shujalpur town (Shajapur district). It is a small compact settlement inhabited dominantly by Kshatriyas (31%) close to the river Jamned; next to them are the agricultural castes (17%) and Brahmins (12%). Agricultural labourers constitute over one-fourth of the population. The core of the village is occupied by the Kshatriyas and Brahmins with a temple of Gopal (Krishna), while the other people occupy the marginal areas of the main settlements (Fig. 14. 10).

Enclosures (*Baras*) for storing fodder, fuel and for threshing are distinct features of the settlement, being located on the fringes. A detached hamlet has grown to the south of the main settlement inhabiting Deshwali Patels around a temple. An outlying hamlet beyond the river has also developed inhabited by Muslims and scheduled castes.

Dwellings are all mud-walled and tiled, with one to four rooms according to the status of the occupant. The scheduled castes generally have one-room houses.

Agriculture is the main source of livelihood. 66% of the total area is under crops (jowar 40%, wheat 31%, cotton 14% and others 15%) and 21% of the total area is yet to be cultivated. The Kharif crops cover 63% of the sown area & wheat and gram are main Rabi crops. The village has a cooperative society which runs a leather working unit and provides credit facilities.

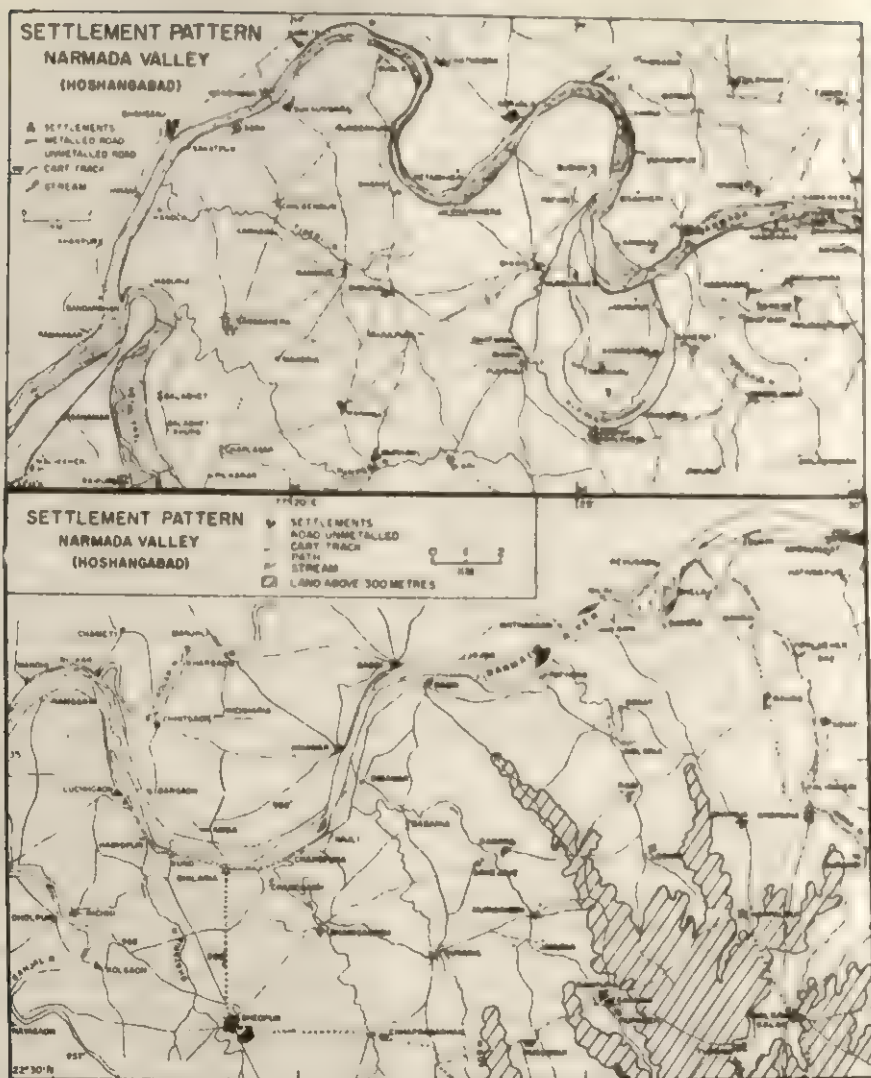


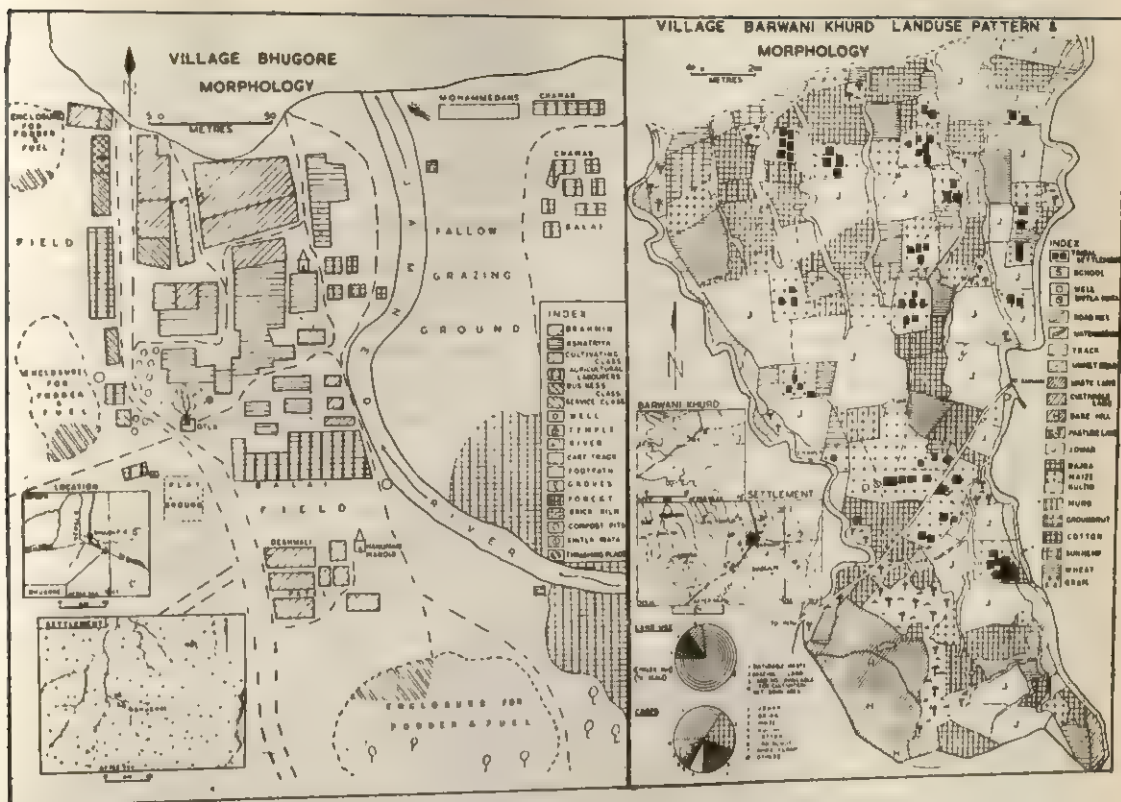
Fig. 14.9

Badwani Khurd, situated on lower slopes of Bawan Gaja Hills in Satpura Range south west of Barwani town, it is a typical tribal village ($22^{\circ} 5' N-74^{\circ} 53' E$; 1970 Est. Pop. 1,020) with predominating Bhilala tribals. Their habitations represent low, small, thatched and tiled houses having mudwalls supported by wooden rafters (Fig. 14. 10).

The settlements are highly hamleted and are scattered in arable blocks. The nearby rivers are the main source of water supply. A metalled

road passes through the main hamlet in the southern half of the village.

Over 75% of the total area is under cultivation. Jowar, bajra and maize are the main crops covering 75% of the net sown area. Maize is largely grown around the settlements. The hills in the south of the village are stripped off their forest cover and the people have to seek forest produce from other areas. Agriculture is also supplemented by cattle and stock-raising and poultry.



Recently a primary school has been provided in the village with about 25 school-going children and one teacher but the tribal outlook is yet to change.

Urban Settlement : Most of the towns of this region have village origins, with some having historico-political significance and enjoying location on river banks or on ancient highways. During the medieval period, quite a large number of towns were added, sometimes beside the ancient ones, causing their decay, and sometimes over the ruins of the early ones viz. Vidisha beside Besnagar and Ujjain on the old site of Ujjayini or Avantika. Quite a number of towns during this period grew as trade centres or headquarters of the dynasties of the Delhi Sultanates. During the modern period urbanization alongwith modification of old ones is taking place rapidly.

Between 1901-1961 urban growth has been steady. The decades of 1941-51 and 1951-61 have recorded an urban increase of 28.2% and 37.7% respectively mainly due to increase in the number of towns, from 62 in 1901 to 116 in 1961. Rugged topography and lack of industrial development have prevented the growth of towns in some tahsils. Except a few performing religious, recreational, transport and industrial functions, all towns are by and large administrative in character.

There are certainly some large rural settlements which are towns in embryo. Prominent among them are Fatehabad, Bhairogarh, Jhandi in Ujjain; Bagod, Sakraweda in Ratlam; Hatod, Manipur, Betima in Indore; Dhamnod in Dhar; Rustampur in Khandwa; Akodia, Sundarsi, Kalapipal in Shajapur; Berasia, Chepner in Sehore; Kotra, Pachor in Rajgarh districts.

Morphology of urban centres is governed by a complexity of physical and human factors. The lately developed administrative, industrial and institutional functions have further modified the aspect, morphology and functional character of the towns.

In most of the towns two or more than two sections are found—the one the old town and the other the newly grown areas. The older sections having bazars are more congested and

have narrow winding lanes with mixed type of buildings and generally lack open spaces and parks. The new sections contain new shops, markets, civil lines and cantonment areas, and in some cases, railway colony, and professional or service institutions

Sample Towns

Indore (1961 Pop. 394,941) : the largest city of the State today, had a humble beginning some

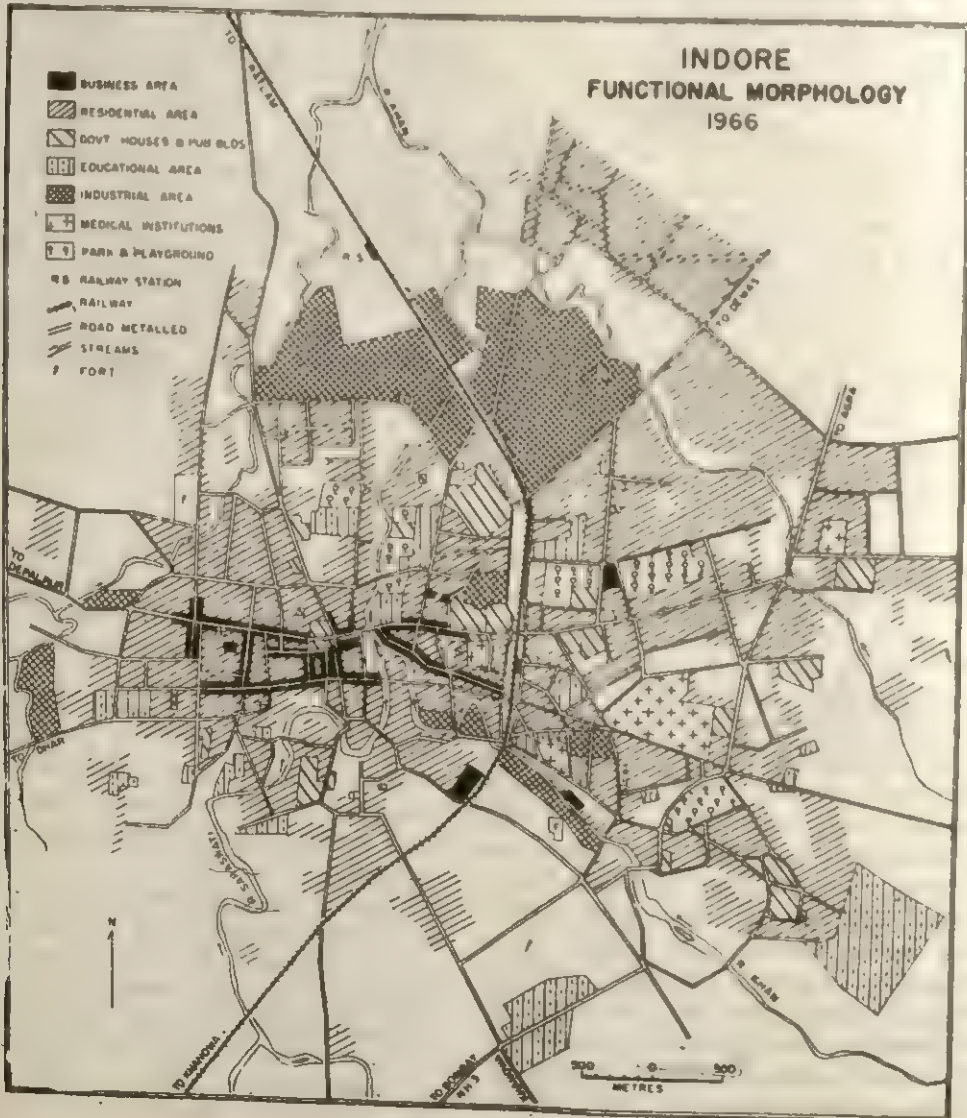


Fig. 14.11

two hundred and fifty years ago. The site, a well drained and gently sloping ground on the confluence of two small streams, the Khan and Saraswati, had obvious advantages (Fig. 14.11).

The protection offered by the patronage of local 'Zamindars' and later erection of Indreshwar temple in 1741 gave stimulus to the growth of the place. Ahilya Bai made it the de facto capital of Holkar state which provided further impetus to its development; and by 1820 population increased to over 63,000. Further expansion took place westwards beyond the original settlement known as Juna Indore, around the Royal Palace, the Rajwada.

During the later half of the 19th century, rail and road transport development brought new changes, the cotton textile industries were established and its population grew to 83,091 by 1880 and to 203,695 by 1941. After the merger of the State with Madhya Bharat (1948), it registered immense growth (1951 Pop. : 310,859) as a capital of a large state. Though the State capital was shifted to Bhopal in 1956 the city has been able to maintain its growth.

Indore is one of the few Indian cities which had the benefits of town planning at an early stage of urban growth. Roads with overbridges were constructed at proper intervals to keep pace with future developments and industrial establishments occupied outer fringes.

Due to its central location the city has also developed as the most important centre of wholesale and retail trade. It has distinct commercial specialized zones like the cotton market, M.T.C. Cloth market, Nandlalpura (vegetable and fruit), Sanyogitaganj and Laxminagar (grain), Surjuaganj and Jawahar Marg (hardware and transport goods), Godi Adda (grass and firewood) and Navlakha and Labria Bheru (saw mills and timber stalls).

The industrial zone is well marked in the north, though small undertakings are widely spread. The newly built hospital, one of the biggest hospitals of India, lies in the eastern part.

The city is developing fast into a large metropolitan centre and spatial expansion is taking place in all directions especially along the Agra-Bombay N.H. 3. (Fig. 14.11a).

Dhar (1961 Pop. 28,325) is a district headquarters, developed on a well-drained site near the Munj Sagar (a big tank). It owes its origin to Raja Munj Vakpati who established his capital here. It continued to be a capital town till the Parmar rule, but experienced decline when Hoshang Shah shifted his capital to Mandu in the beginning of the fifteenth century. Later it became the capital of the princely state of the Puars and continued to enjoy this position till the merger of the state with M.P. after Independence.

The town has grown under the shadow of a Fort which is still visible in the landscape. Like any other district headquarters it is primarily a residential town with the Civil Lines in the north-east. The business activities are developed along the two central streets, the Ratlam Street and the Indore Street. Since Independence new institutions like degree college, transport depot, hospital etc. have developed in the outlying areas. The places of historical interest are the Bhoj Shala, the Kamal Maula, Lat Masjid, the Lat and the temple of Kalika Devi, etc.

Bagli (1961 Pop. 3,638) was a small village on the Kali Sindh river, occupied by the Thakurats and others around the fortress. It was developed solely for the purpose of maintenance of law and order in dacoit-infested area.

Predominantly residential, it is characterised by a sizeable settlement of craftsmen who are engaged in household industry. Being a tahsil centre, it has developed administrative offices located along the main road outside the main residential area. Educational and service institutions are on the fringes.

Hoshangabad (1961 Pop. 19,284), established by Hoshang Shah, the town evolved as a transport node and river front settlement in the Narmada valley. Its present development is associated with its administrative function as a district headquarters (Fig. 14.12).

Pashmarhi (1961 Pop. 6,124), a small town located on high ground surrounded by hills on all sides, developed as a hill station in M.P., enjoying as it does a comparatively cool and healthy climate. It was subsequently developed as a military cantonment. Till recently it was the

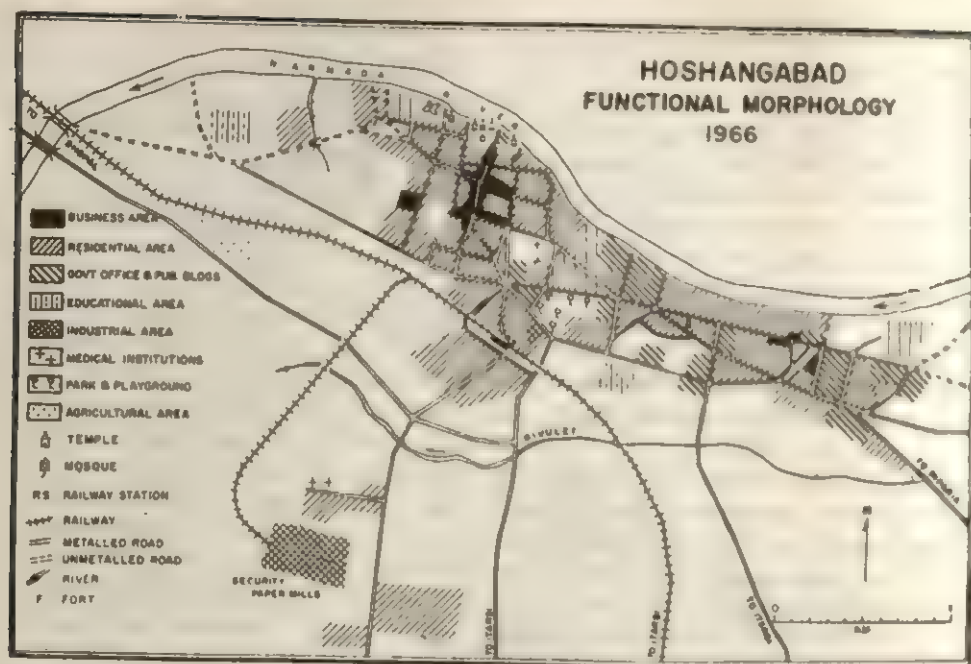


Fig. 14.12

summer capital of the State. It has developed some good picnic spots like Panch Pandav, Rajendra Giri and Ekantgiri which attract large number of tourists (Fig. 14.13).

Agriculture

The regional economy is dominated by agriculture as it engages 80.2% of the total active workers and is the mainstay of the bulk of population. About 44% of the land is under cultivation while a further 10% can be brought under the plough. Thus, well over 54% of the land can be put to agricultural uses leaving enough land for grazing and groves.

The areas under different crops show the varied character of agricultural production and the relative importance of different crops. Food crops predominate and account for nearly 70-80% of the total sown area. Kharif is everywhere more important exceeding Rabi by over 10-15%, against M.P.'s figures, showing excess of Rabi over Kharif by nearly 60%.

Jowar among the food crops still stands unrivalled accounting for 47% of the total cultivated

area. Other crops in descending order are wheat, maize and gram alongwith arhar and moong. Amongst fibres, cotton and hemp predominate. Millets, cotton, maize and til form the chief products of Kharif (*Sayalu*) and wheat, gram, linseed and poppy of the Rabi (*Unhalu*).

In Southern Malwa, 1.64 million agricultural workers live on 2.5 million hectares of cultivated area giving an agricultural density of about 66 persons per 100 hectares while in the Malwa region as a whole, 4.8 million agricultural labourers and cultivators live on 7.3 million hectares of land giving an agrarian density of 66.3 per 100 hec. High densities will naturally be found where arithmetic densities are high or where the proportion of sown area is small as in Akrani, Partabgarh, Banskara, Jhabua etc. Rajpur tahsil (W. Nimar) has both high arithmetic as well as agricultural densities. On the other hand Khandwa, having large cultivated area, although densely populated, has a lower agricultural density. Indore, Vidisha, Raisen, Sagar, Ujjain and Sehore districts have low agrarian density having 42-57 persons per 100 hec. against higher densities of Dhar (251)

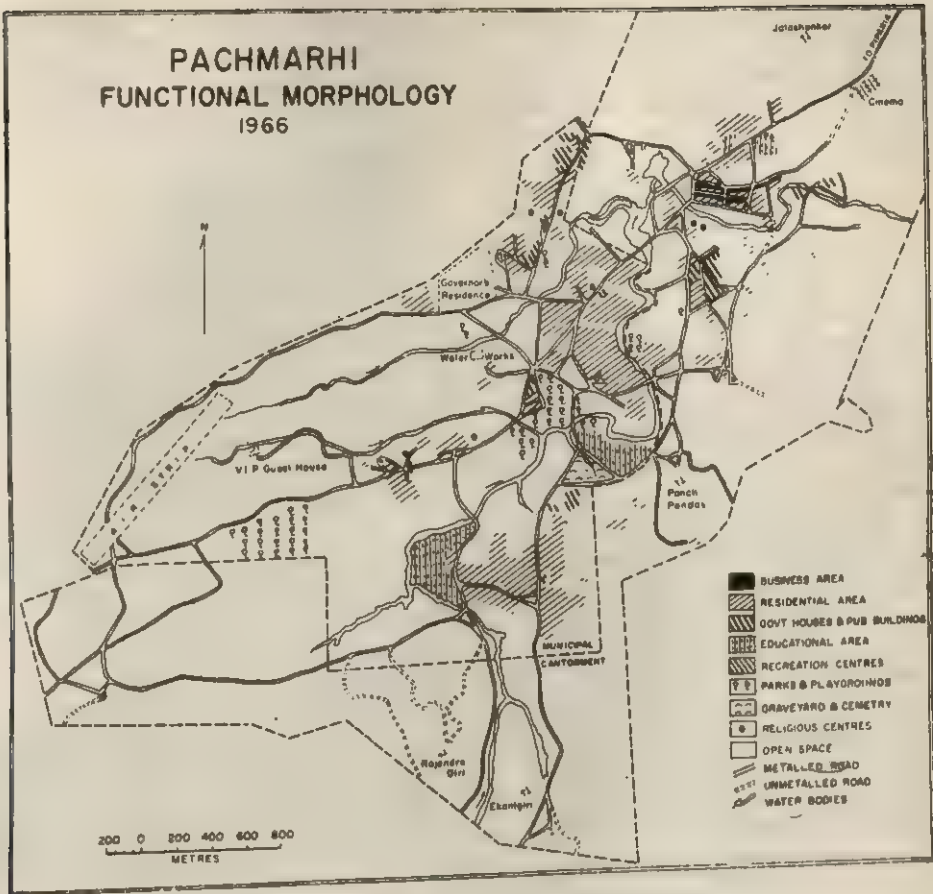


Fig. 14.13

Jhabua (87), Betul, Raisen (75 each); the districts having medium densities are Ratlam (63), Dewas (61), Shajapur (68) and Mandsaur (73).

Cropping System : Over vast stretches of the black cotton soil, cotton and wheat or jowar are the main crops (Figs. 14.14 and 15). Rotation is followed almost everywhere. When rainfall is poor only Kharif crops are grown and the land is left fallow till the next Kharif crop. Another practice is to grow a Kharif crop in the first year, keep it fallow for the Rabi crop as well as for the Kharif and then grow Rabi crop. In the third type of rotation a Rabi crop is grown in the first year and a Kharif crop is obtained in the next year.

The most common mixture is jowar with red gram (tuar), but green gram and red gram are

often mixed together. Cotton is sown with black gram (urd) and sesamum. Maize and black gram are sometimes grown together. Other combinations are sesamum and jowar, cotton and red gram, sesamum and black gram, wheat and gram, and linseed and wheat. Sugarcane and vegetables or poppy are very commonly grown together.

The rotation is practised in the region, firstly to minimize the effects of the failures of some crops on account of vagaries of seasons, secondly, to maintain soil fertility, thirdly to effect proper distribution of labour and, finally, to maintain selfsufficiency providing all types of foodgrains required by the cultivators.

The general distribution of crops exhibits a great deal of diversity which is largely related

to the varying combinations of relief, rainfall and soil conditions. Seven crop associations may be distinguished (Fig. 14.14).

Rice assumes importance locally as in Harsud in Hoshangabad. In poorer hilly areas, a group of coarse millets known as kodon, kutki and



Fig. 14.14 : Crop Combination Regions, 1965-66

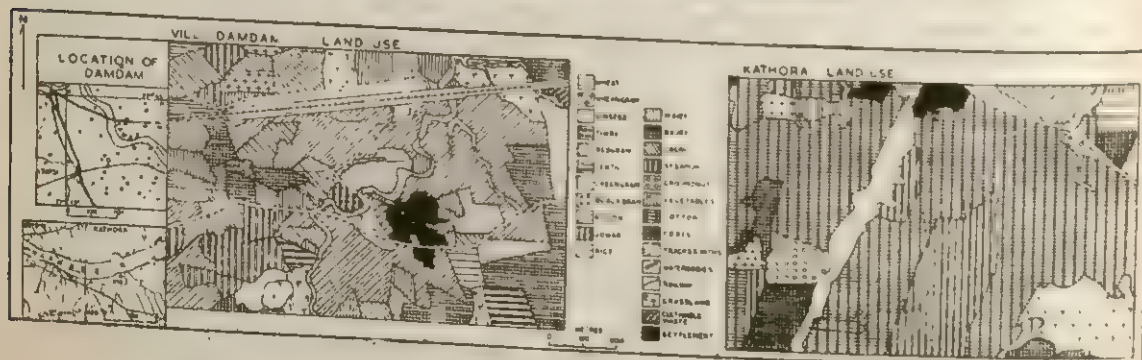


Fig. 14.15

banti is grown mostly in Betul and Alirajpur. Bajra is grown in Alirani and Banswara. Tuar, oilseeds and sugarcane are also grown on small scale.

Tanks, wells and tube wells are the chief means of irrigation in the region and only 5% of the total cropped land is irrigated. Tanks and *bunds* are important on the Plateau area while the wells and tube wells in the Narmada Valley. The region has, however, great potential for developing irrigation facilities through tube wells and river projects.

Livestock : Malwi, Nimari, Nagauri and Rath breeds of Malwa are among the best in India for their performance in milk yield and draught capacity. Umatwari breed is found in Jhalawar, Rajgarh and Guna districts while Gondi, a cross-breed of Malwi, and Nimari in Dewas, Sehore and Nimars.

Mandsaur district has the maximum number of sheep and goats followed by Indore, Ratlam, Guna and Ujjain. Banswara is famous for goats. Jamunapari goats are found in the northern part and Barbary in southern region. Chokla breed of sheep, being the most important and renowned as the Indian Merino, is found in Jhalawar and Guna. Bikaneri and Jaisalmeri camels are confined to the northernmost parts only. Next to bullocks, horses, donkeys and mules are commonly used as draught animals.

Industrial Economy

Industrially, Malwa occupied the first rank among the Moghul Subas after Gujarat. Cloth of the finest texture was woven here.¹² Fine muslin and chintz of Sironj and Chanderi were famous cloths exported to Iran and Turkey.

Leaving aside cotton textile, sugar, a few metal based factories and some agro-based industries, the regional industries invariably are confined to small scale and cottage types.

The Chambal Power Station and the Punasa Project have been commissioned in 1962 and 1968 respectively and supply power to the industrialised towns of Ujjain, Indore, Bhopal and Khandwa. In addition, thermal power plants have also been installed at Indore, Ujjain, Ratlam Dewas, Mandsaur and Dhar.

Among the *agrobased industries* cotton textiles are important. There are 18 factories, mostly in Indore, employing about 25,000 persons and producing about 307 million metres of cloth. This is the largest single industry not only of this region but of the whole State in terms of both employment and output.

Handloom cotton industry is scattered all over the region in rural centres, Chanderi and Maheshwar being famous since long. *Cotton ginning* factories number 70 and employ about 5,000 persons. *Cotton pressing* mills numbering 18 employ about 1,000 persons. Other agricultural processing industries are rice, oil, dal and flour mills.

Sugar mills in Mandsaur, Ujjain, Ratlam, Sehore and Rajgarh are important, producing 2,692 metric tonnes of sugar. Sugar industry is the second most important industry of the region.

Oil crushing is another important industry accounting for about half the number of mills of the State (138). These are located in the oil-seed growing districts of Mandsaur, Ujjain, Dhar, Shajapur, Dewas, Nimar, Ratlam and Sagar. Biscuit and confectionaries are other agrobased industries. Agricultural implements are made in Barwani, Khandwa and Indore.

Forest Based Industries include saw milling at Itarsi, Jhalawar and Mandsaur. A Paper Mill has been started at Hoshangabad. Other paper mills are in Indore and Ratlam. Sehore has got one cardboard factory. Six silk mills exist in Indore.

Bhopal, Ratlam and Neemuch have bone-crushing mills having a capacity of 30 tonnes per day. Dairy industry is centred in big towns like Indore, Bhopal and Mhow. Tanneries of Udaipura and Indore are important. Blankets and carpets are made in Indore.

Important ceramic factories in the region are in Ratlam, while brick factories are in Ujjain and Indore. Mandsaur has got one cement factory with an annual capacity of 170,000 tonnes. Indore and Ratlam have spun and hump-pipe works.

Engineering Industry is still in infancy being mainly concentrated in Indore. Bhopal and Ujjain have one medium-sized foundry each for hardware.

In Bhopal, Heavy Electrical Plant has gone into production and is one of the famous plants in India.

In the Third Five Year Plan, units such as Central foundry and forge plant, small machine tools at Indore and agricultural implements at Ujjain have been nearly completed.

There are five pharmaceutical and chemical works, 2 match factories, 8 paint making units and 3 soap factories (Fig. 14.6).

Small scale and cottage industries are relatively more important in the regional economy. Nearly 90% of the total employment in such establishments is accounted for by 16 industries of which cotton spinning and handloom weaving is by

far the most important. Other notable industries are shoe making and pottery, followed by basket making, black smithy, oil pressing and carpentry.

Transport

The traditional passage-way character of Malwa is reflected through the present route network. Important trunk routes connecting Delhi-Madras, Delhi-Bombay and Calcutta-Bombay pass through the Region (Fig. 14.16).

The main railway line from Bombay to Allahabad (and onwards to Howrah) crosses the Satpuras via the Burhanpur gap. Itarsi is the most important junction in the area where Delhi-Madras route crosses the former. Another broad

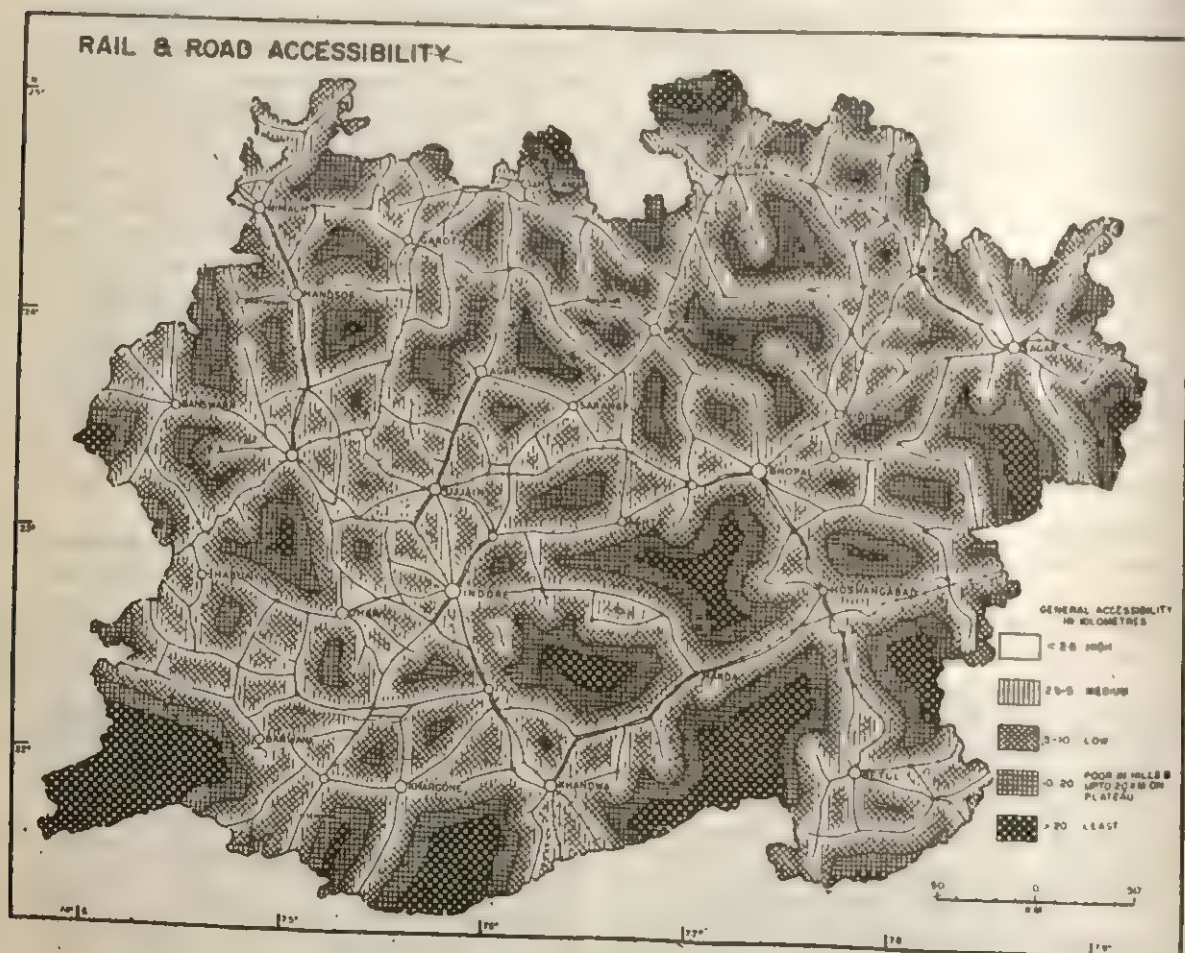


Fig. 14.16

gauge line enters the region near Ganeshganj in the east and passes through Sagar, Bina and Guna where it leaves for Kota near Rothial station. Another broad gauge line (Delhi-Mathura-Baroda-Bombay line) enters near Ramganj-Mandi and passes through the important junction of Nagda and Ratlam in western Malwa region and leaves M.P. beyond Meghnagar. Passing through the middle of the plateau another broad gauge line joins Bina, Bhopal, Sehore, Ujjain and Nagda. One branch line joins Ujjain with Dewas and Indore covering above 80 km.

The main metre-gauge line (Ajmer-Akola line) enters near Mardar in Burhanpur (Khandwa), and passing through Khandwa, crosses the Narmada at Omkareshwar and climbing the Vindhya joins Indore, Fatehabad, Barnagar, Ratlam, Mandasaur and Neemuch and leaves the region near Jawad Road. A separate branch joins Ujjain and Indore. A narrow gauge line joins Ujjain with Agar. The map shows clearly that rail communication in the region is inadequate and lags far behind the need. Even some districts (Dhar, and Rajgarh, Banswara, Pratabgarh, Achnera) and most parts of Jhalawar, Jhabua and Khargone have no railways. The region has 1.42 km of railway lines per 100 km².

As a result of different gauges there are break-of-bulk points at Ratlam and Khandwa which create bottlenecks.

The region is widely traversed by roads. The National Highway Nos. 3 (Bombay to Delhi), 26 (connecting Sagar with Lakhnadon) and 12 (passing from Biora through Shampur, Bhopal and Bareilly) serve the region widely, covering about 1,300 km route-length.

State highways link most of the important urban centres of the region. Mhow-Neemuch road (about 260 km) passes through Indore, Dhar, Ratlam and Mandasaur districts. Indore-Ujjain-Jhalawar Road (236 km) is an interstate route connecting M.P. with Rajasthan. The main articles transported on this road are cotton, foodgrains and cattle. Dewas-Bhopal-Sagar road (about 235 km), Bhopal-Betul-Indore-Khandwa, Bhopal-Guna and Itarsi-Khandwa-Barwani roads are also important.

The influence of topography on the distribution of road network is clearly marked and roads run parallel to the ranges and the Narmada Valley. The northern bank of the river is served only by approach roads from the north and sometimes by link roads; but in certain places the northern part is wider and better served viz. in Jhabua, Dhar and West Nimar. The road density is rather low in the Narmada Valley because of its narrowness.

The accessibility map shows clearly some pockets of inaccessible areas existing in Harda, Harsud, Khandwa, Wn. Banswara, Barwani, Udaipura, Rehli, Betul, Wn. Guna and the Dhar Upland and Nasrullaganj areas.

The total length of surfaced roads is 10,526 km and of unsurfaced roads 5,528 km giving 7 km of surfaced and 3.7 km of unsurfaced roads per 100 km².

The growth of goods traffic is increasing mainly due to the fact that road routes are in some areas shorter and straighter than railway routes; i.e., Bhopal-Ujjain-Indore which plays a part in attracting goods as well as passengers traffic by road.

Malwa Region is linked with Bombay on the west and Delhi in the north via the two airports of Indore and Bhopal. There is only one service each from Delhi to Bombay and vice versa passing through the two airports.

The Regions

The various physical and cultural aspects reveal themselves in diverse areal associations which give rise to different sub-regions with distinct personalities. Historical and other cultural factors also impart 'colour of distinctiveness to each region in terms of resource utilization patterns and types of economic activities and economic landscape.'¹³ Essentially there are two first order regions: The Malwa Region North or the Malwa Plateau and the Malwa Region South. Further, 6 second order and 16 third order regions may be recognised as follows (Fig. 14.17):

27. The Malwa Region North

- a) The Upper Mahi Basin
 - i) Upper Mahi Basin East
 - ii) Upper Mahi Basin West

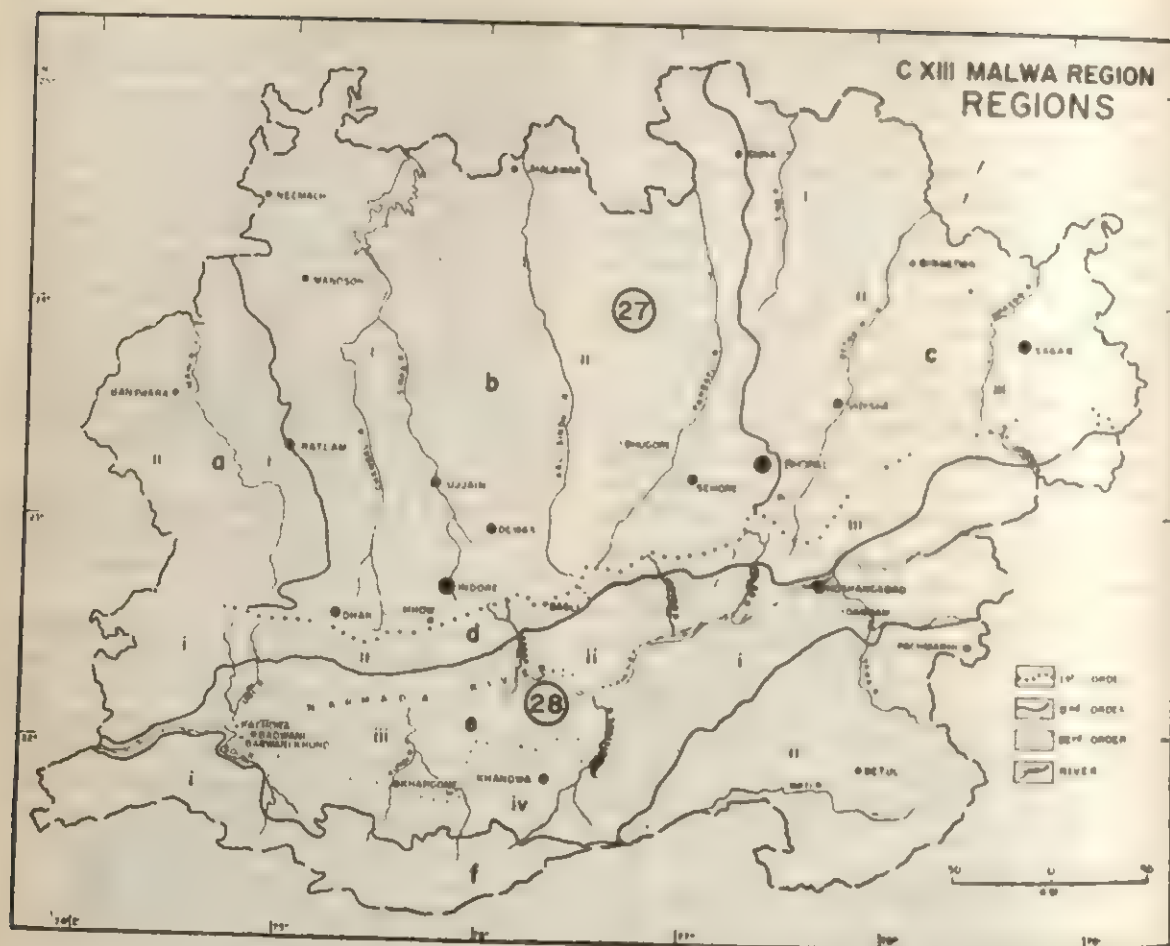


Fig. 14.17

- b) *The Upper Chambal-Parbati Basin*
 i) The Upper Chambal-Supra Region
 ii) The Upper Parbati-Kali Sindh Region
- c) *The Upper Betwa Basin*
 i) Upper Sind Basin
 ii) Vidisha Region
 iii) Sagar Plateau
28. *The Malwa Region South*
 d) *Western Vindhya*
 i) Bagh Hills
 ii) Uri-kanar Tract
 iii) Kanar-Sindhore Trac
 e) *Narmada Trough West*
 i) Hoshangabad Plain

- ii) Dhar Upland
 iii) Nimar (Maheshwar) Plain
 iv) Nimar Upland
- f) *Western Satpuras*
 i) Rajpipla-Asirgarh Region
 ii) Kalibhithi-Betul Region.

The Malwa Region North

Physiographically, Malwa Plateau has some uniformity. The western part of this region is drained by the Mahi, the middle by the Chambal and its affluents and the eastern by the Betwa and the headwaters of the Dhasan and the Ken. Water-divides between these, undoubtedly, form boundaries between the Mahi Basin on the one hand and the Betwa Basin on the other. Thus, we

have three second order sub-divisions, viz. Upper Mahi Basin, Upper Chambal-Parbati Basin and Upper Betwa Basin.

The Upper Mahi Basin : Passing from Nagda in Dhar to Ratlam by road there is change in terrain and cultural setting from east to west. The headwaters of the Mahi turn the area into a dissected, rugged and undulating plateau merging with the offshoots of the Western Vindhya running northwards. Soil is less retentive and reddish in colour; scattered boulders of basalt are strewn in the area and increase in intensity as one reaches the ravines of the Anas and the Mahi flowing through and sometimes by the side of the high eye-brow of the Bagar; the tract slopes towards north-west and then southwestward where the Mahi turns towards Gujarat. Compact mudwalled, tiled houses take the shape of wooden, thatched, tiled wattles of the Bhils; Mahi being replaced by Bhili and Rajasthani, multicoloured dress of Malwa proper disappearing and confining itself to loin cloth and white turban of the Bhils.

The cotton-Jowar belt of the east is replaced here by maize-gram-rice zone and cotton becomes insignificant. Being mostly tribal, 80-90% of villages have below 500 inhabitants and there are only seven small towns. It may be easily divided into two subregions : (i) Upper Mahi Basin East, (ii) Upper Mahi Basin West.

Upper Mahi Basin East : is drained by the headwaters of the Mahi. This region differs from its counterpart in the west in the physical landscape as a whole as it has higher elevation, plateau character and medium black soil. Cultural landscape is transitional between the Malwa people in the east and the tribals in the west. Petlawad is the only important town, Dalot, Sagthali being the other centres. Badnawar, Sailana and Partabgarh towns lie on the margin.

Upper Mahi Basin West : is characterised by rugged and dissected terrain, high banks along the rivers, strewn with boulders, hill slopes covered with bamboo and other forest species, tray-like depressions between higher spurs covered with deep black soil, Bhil hamlets occupying the cultivated parts and rainfall ranging from 75 to 88 cm. Maize, gram, rice and jowar are the

main crops. The population density ranges from 57 in Partabgarh to 87 in Kushalgarh and 121 in Garhi (Banswara). The region contains five towns and 82% of the villages have less than 500 population.

Upper Chambal-Parbati Basin : lying mostly above 450 m in the north of the Pariyatra (The Vindhyan Range west) was known in the ancient history as Avanti or Ujjaini, having some of the oldest centres like Ujjain, Dhar and Dashpur; it was occupied by the Malavas, one of the early settlers. The region is covered with black fertile soils and is drained by the Chambal and its tributaries and is enclosed by the Vindhya and its offshoots. The cotton-dominant western part, the Upper Chambal-Sipra Region is distinct from the wheat-dominant eastern part, the Upper Parbati-Kali Sindh Region.

Upper Chambal-Sipra basin : is drained by the Chamla, Chambal, Gambhir, Sipra and the Chhoti Kali Sindh. Sloping from the higher Vindhyan Range from Mandu (Dhar), Singarchori (Manpur) and Bagli (Dewas), the region stretches northward as a rolling upland in Dhar, Ujjain, Indore and Dewas. Its homogeneity is broken by residual flat-topped, sometimes conical hills and mesas and forms a rolling, undulating terrain up to the Vindhyan outcrops in Neemuch, Bhanpura and Jhalrapatan. Cotton, jowar, wheat and maize occupy 90% of the cultivated land in southern districts and poppy and sugarcane are important in Mandsaur while jowar and gram are main crops in Jhalawar.

The region contains the old towns of Dhar, Ujjain and Mandsaur (Dashpur), and other new ones like Indore, Ratlam, Neemuch and Dewas. In addition to these, 27 small towns of the region are scattered as administrative and trading centres. Rainfall decreases from 108 cm in Dewas to only 88 cm in Ratlam and Mandsaur but the fertile soil has densely peopled settlements, excepting some parts like Jawad, Manasa and Bhanpura tahsils in the north. Now Gandhi Sagar Dam at Bhanpura-Manasa-Kota border has opened new avenues for future development. Two lower order regions can also be distinguished : Dashpur Region and the Avanti Region.

The former is covered by trap formations and only its northern part is covered with the Aravallis and Vindhyan. Clay, shale, and limestone are extensively found here. The area being relatively dry has sparse vegetation. It produces wheat, barley, maize, pulses, oilseeds, poppy, cotton and sugarcane. 10% of the net sown area is under irrigation. It is well developed industrially and culturally. Sugar factories, potteries, ginning and pressing units, oil mills and poppy extractions have contributed to the growth of urban centres like Mandsaur, Partabgarh, Neemuch and Jaora. The area has some cultural affinities with Rajasthan.

The Avanti Region has a marked unity of landscape, climate, soil and socio-economic conditions. The whole tract is covered with trap formations having deep black cotton soil, flat topography with a few hills and ridges. Agriculturally, this region is the major producer of cotton, wheat, maize, jowar, oilseeds, sugarcane and pulses etc. It has the old seats of confederacies and principalities like those of Dhar, Ujjain, etc. and the new industrial centres like Indore, Ratlam, Dewas and Mhow. Here are concentrated cotton textiles, foundries, vanaspati mills, chemical works, etc.

The Upper Parbati-Kali Sindh Region : It is characterized by rolling undulating plateau with terraces in Shajapur and Sarangpur and has lower elevation. Slopes are covered with small boulders of basalt. Higher parts are sometimes covered with *Dhak*, scrubs and date palm along the rivers and dry teak in northern Jhalawar. Rainfall decreases from 124 cm in the south to only 88 cm in the north where forest cover is insignificant (Rajgarh only 8% and Shajapur almost nothing). Villages are compact to semi-compact. Flat tiled houses are often inferior to those found in Indore, Ujjain and Dewas. The region is traversed by N H 3 joining Biora, Pachor, Sarangpur but is devoid of rail routes.

The Upper Betwa Basin : drained by the Betwa, Sind and Dhasan and the headwaters of the Ken, this region is enclosed by the arms of the Vindhyan range in the west and south and by Bundelkhand in the northeast. The region can be divided into

three sub-units : the Sagar Plateau, Betwa Valley (Vidisha Patti) and the Upper Sind Basin. Upper Sind Basin is traversed by the spurs of the Vindhyan Range extending into the Gwalior region in the north and is drained by the Upper Sind. The soil is black to mixed black and grows mainly wheat and jowar. Forest covers 14% of the total area in Guna and 11% in Vidisha. Population density is low here, the average for Guna being 54 per km² only as against the Regions average of 85. Villages with less than 500 persons account for 87% of the total number. Compact type of settlements are common.

Vidisha Region (Bhilsa Patti) : is one of the oldest settled parts, Vidisha (Besnagar) being the well-known regional seat of Ashoka. Here lie the famous Buddhist caves of Udaigiri and Stupa at Sanchi and the old centres of finest textiles in Sironj and Chanderi. The Region forms one of the best wheat producing parts of Malwa. Bhopal, Vidisha, Sironj and Bina-Etawa lie in this tract. Bhopal is a fast growing town since it became the State capital of M.P. (1956).

Sagar Plateau : lies on the eastern edge at about 457 m elevation. The relief of this tract is best understood in terms of physical divisions which are represented by alternating basins and ranges with varying relative relief. Wheat, gram and linseed are the main crops. Sagar is the regional centre located on Bina-Katni railway and N. H. 26. The town enjoys a natural site around a large lake (400 acres) surrounded by hillocks. It was first planned by Govind Rao Pandit as a capital of the Sagar Kingdom of the Peshwas. The British made it the Commissioner's headquarters and a large cantonment in 1818. Civil lines were developed in Gopalganj area near the lake, partly over its drained portion. Since Independence and with the establishment of the university on the hill-top in the south-east, the town has exhibited a rapid growth and has grown to a Class I city (104,676 in 1961). Now a Master Plan for its development has been prepared with three important schemes covering the extension of the residential, commercial and transport facilities and industrial zoning based on local resources (Fig. 14.18).

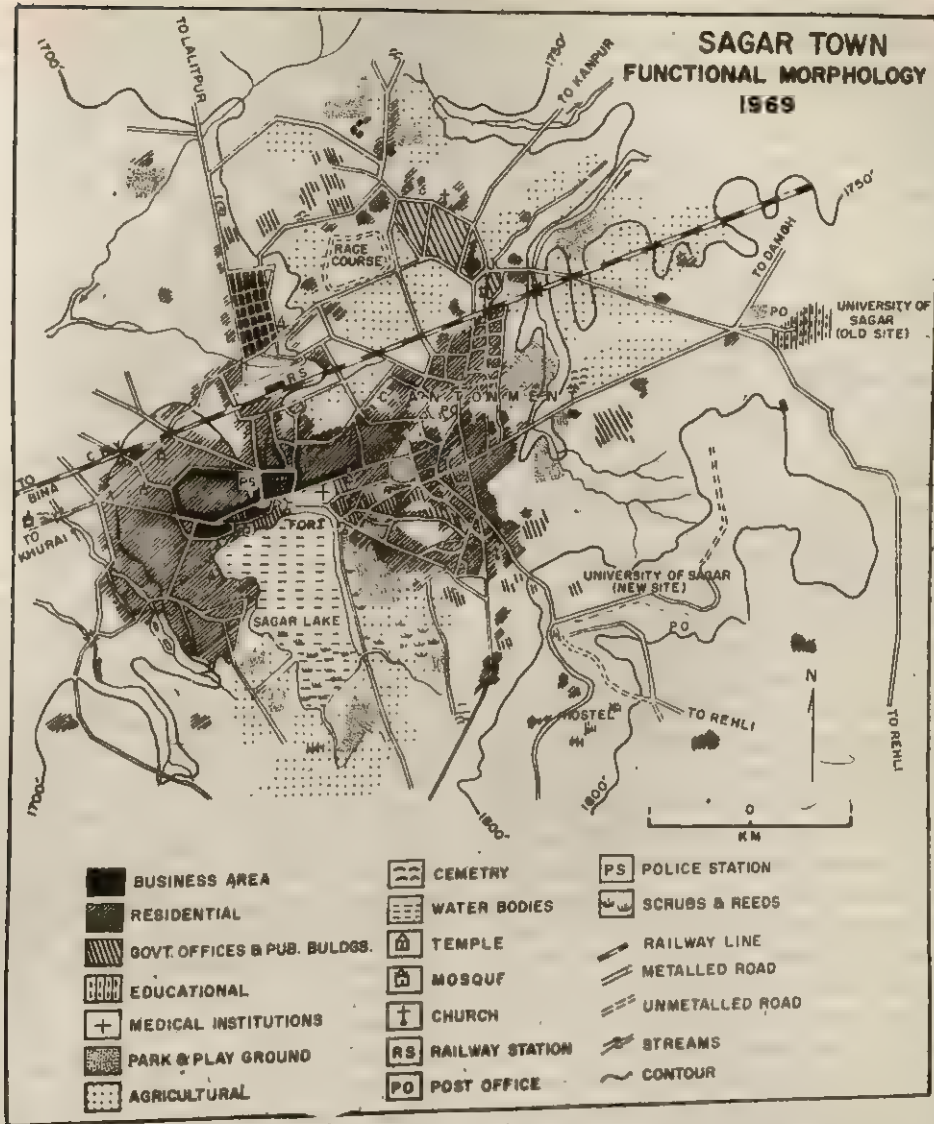


Fig. 14.18

The Malwa Region South

The whole tract in the south of the great basaltic plateau comprises of the ranges of the Vindhya and the Satpuras separated by the Narmada Trough in between. Physiographically, it is a separate unit having greater diversity of relief, slope and other geomorphic features in contrast to the northern counterpart. The Vindhya with pro-

nounced escarpments are quite different from the trough below. The Satpuras in the south have also distinct landscape. Culturally they are all akin to the Malwa Plateau in the north but relief, drainage system and general outlook make this part distinct enough to be treated as a first order region which can be divided into three second order regions: the Western Vindhya, the Narmada Trough West and the W. Satpuras.

Western Vindhyas : The Vindhyan range stands out as a line of scarps overlooking the Narmada Valley. It has black soil and forest cover throughout and is dotted with settlements in the depressions carved out by the headwaters of the north and south flowing rivers. Here live the Bhils, the Banjaras and the Gonds with their wattle houses, the primitive plough and the bow and arrow. Three subregions may be recognised, the Bagh Hills, Uri-Kanar Tract and the Kanar-Sindhore Tract.

The Bagh Hills : are named after the famous Bagh caves, excavated on the rocky surface. The low hills with poor cultivated land are locally known as *Dongaris*. They are drained by the Hatni in the west and the Uri in the east and differ from the Vindhyas proper in that the typical escarpment is lacking here.

Southwest of the Bagh hills and overlooking the Narmada gorge are the Trappean Mathwar Hills, rising to more than 600 m elevation. Here the rainfall ranges from 75 to 85 cm. The sandy and yellowish soil developed on metamorphics grow millets, maize and jowar. The density of population is low due to low percentage of cultivated land. There are only two towns, Jobat and Alirajpur. Both are tahsil headquarters.

The Uri-Kanar Tract extends from Gomanpur peak to Udainagar; the scarp is dissected by the Uri, Man, Karam, Ajnar, Choral and Kanar rivers which flow through gorges and develop waterfalls, particularly near Udainagar, all exhibiting youthful features. Several flat-topped hills have spurs which descend from the scarp towards Narmada, e.g. the Arveli Hill (659 m) and the Mograb (751 m). Having the highest peak of Singarchori, historical centres of Mandu* and Manpur, thick forest and sparse population, this region is, agriculturally speaking, a negative area. It is crossed by several roads, the most important of which is the N H 3, and also by the Khandwa-Indore-Ajmer railway line.

The Kanar-Sindhore Tract : East of Udainagar, the Vindhyas swing north-eastward, north of Kannod but they again come close to the Narmada near Hoshangabad. Here the sandstones alternate with shales giving rise to a terraced slope. The area is geologically complex. In addition to the Trap, banded gneissic complex, Lameta and Vindhyan formations are observed. Barytes, clays, manganese and other minor minerals occur in these formations. The Vindhyan scarp is thickly forested with teak, sal and other similar species which account for 56% of the green wealth. It is a richly forested area while the Bagh Hills have richer mineral resource. Agriculture and forestry are the two main occupations. Agriculture is confined to river valleys producing wheat, maize, cotton, pulses, oilseeds and gram. Transport facilities are inadequate and have retarded the industrial and commercial development. The only important settlements are Keshli, Silwani, Sultanpur, Goharganj and Obedullaganj.

Narmada Trough West : The trough lying generally below 450 m elevation is physiographically divided into the Hoshangabad Plain, the Dhar Upland, the Nimar Plain and the Nimar Upland.

The Hoshangabad Plain : With level stretches of land and heavy black soils, large percentage of cultivated land, a larger number of settlements and developing towns, this plain is the most important part of the Malwa Region South. The region produces wheat, cotton, jowar, gram and sesamum. It contains nine towns, Hoshangabad being older and district headquarters; Itarsi is a newly developed commercial centre and an important railway junction. Its timber industry contributes adequately to the regional economy.

Dhar Upland : Drained by the Kanar and Chankeshwar rivers, the Dhar Upland differs from the plain in that the main formations here are resistant, unclassified Vindhyan and metamorphics. Dissected and undulating terrain, thick forest on hill spurs and diversity in slope and relief together give the region a distinct landscape in contrast to the scarp land in the north and the trough plain below. The tract dips southwards and merges with the valley though mesas and residual hills are not uncommon. The

* Mandu was important during Parmar rule and became the capital of Hoshanga Shah in 1405 and of Baz Bahadur in 1560.

prevalent crop combination is jowar-cotton-wheat. The percentage of cultivated land to total area is only 27 in the Bagh tahsil and 37 in Kannod. The Dhar Upland is sparsely populated, the rural density being 17 per km² for Bareli and 19 per km² for Kannod.

Nimar (Maheshwar) Plain : is enclosed by the 300 m contour and lies on both sides of the Narmada. Bagh hills and Barwani Hills lie in its west. The terrain is more undulating here than in the Hoshangabad Plain and rainfall is also comparatively lower. The soils of the Nimar plain are also less retentive. The most important crops are cotton, jowar, groundnut and wheat. The wetter and denser eastern part grows cotton on more than 25% of the cultivated area. The western part receives less than 75 cm annual rainfall and the soils are also more moisture-retentive. Here, jowar, occupying 28% of the sown area in Rajpur and Barwanli, is an important crop followed by groundnut, wheat and maize. The valleys of the Chhota Tawa and the Beda are, in particular, the most fertile and prosperous areas of this plain. The region contains fourteen old and new towns—Maheshwar, Mandleshwar and Khargone having greater regional significance.

Nimar Upland : lies generally above 300 m elevation, entirely south of the Narmada. It is drained by the upper Deb, the Kundi and the Chhota Tawa. Taking Sendhwa as the typical tahsil, the most important crops in this region are jowar, groundnut and cotton. The density of rural population is 54 per km², the figure being low due to the presence of much hilly ground. The upland is traversed by several roads including NH 3 in the west, while Ajmer-Khandwa-Akola railway line runs in the east. Khandwa tahsil is bestowed with more fertile soils which have given rise to well-settled, big, compact villages like Piplod, Rustampur etc. Khandwa and Sendhwa are important towns, the former being administrative as well as industrial centre and the latter a trading centre on N H 3.

Western Satpuras : Known differently at places as the Akrani Hills, Asirgarh Hills, Kalibhithi Hills and Mahadeo Hills (Pachmarhi Hills, Morand Plateau and Betul Plateau), the region is chara-

cterised by hilly topography, poor soils, meagre agricultural resources and age-old agricultural practices. Covered in large parts by forests, these hills are peopled by the Bhils and Korkus in the west and by the Gonds in the east. The most important crops are *Kodon, Kutki, Jowar, Bajra, Sawan* and maize. The western Satpuras can be conveniently divided into two third order regions, the dividing point being the Asirgarh gap : the Rajpipla-Asirgarh Region and the Kalibhithi-Betul Region.

Extending from the eastern part of the Rajpipla Hills upto Asirgarh gap, the Rajpipla-Asirgarh region is mostly forest-covered. Small pockets of land in depressions are cultivated by tribals, jowar being the main crop. Here the density is less than that of other parts, Akrani having 59 and Akhalkua 69 per km². Tribals with their subsistence economy and meagre resources lead simple life. The rural settlements are small and scattered.

Lying at about 667 m elevation the Asirgarh Hill Fort formerly commanded the main route from the Ganga valley to the Deccan. Not only the Tapti flows through this gap but the break in the Satpuras has also been utilized by the Bombay-Allahabad railway line as well as by a road route. East of the gap are the Trappcan Kalibhithi Hills, while further east is the Morand Plateau developed on the Upper Gondwana sandstones. Betul plateau is dissected by the headwaters of the Morand, Tawa and Tapti. East of Asirgarh the rainfall again increases, ranging between 115 cm (Betul) and 202 cm (Pachmarhi). The most important crops are millets, wheat and gram. Although much of the area is forested, there are large clearings cultivated by the tribals, mainly Gonds. There are three towns in the area namely Betul, Betul Bazar and Pachmarhi.

Problems And Prospects

The region as a whole faces several significant problems. Most acute is the soil erosion resulting from numerous factors closely associated with human occupation. Soil exhaustion, *usar*-formation, weed-infestation and water-logging are subsidiary to the first and the measures for checking the soil erosion will have to be based on comprehensive

programme of soil management. Deforestation through uncontrolled felling, grazing and burning lead to erosion and lowering of soil fertility simultaneously. Forest cover has been so much destroyed that it has upset the necessary ecological balance.

Vagaries of rainfall demand well-organised irrigational facilities to avoid famine, crop failure or to increase yields through intensive agriculture. Rivers causing floods are yet to be controlled and utilized for hydroelectric generation and irrigation. Development of transport facilities, specially in poorly accessible areas needs special attention. "Lack of dependable intraregional and local transport system has not only retarded the development of agro-industries or consumer goods industries but has also hindered adequate agricultural development. Various inputs such as good seeds and fertilizers could not be easily provided to the farmers and so also the difficulty lies with the marketability of goods produced at the farm."

If the various dams planned on the river Narmada are constructed, a chain of lakes, from Jabalpur to Navagam, could come into existence and when full, the lakes will provide a continuous length of navigable waterway, with suitable locks at places. When so developed, the Narmada will open up large parts of the interior for further exploitation, particularly of timber and other forest produce.

According to the new Road Development Plan for 1961-81, National highways joining, Barchi-Bhopal-Indore-Jhabua-Nadiad, Nagpur-Betul-Hoshangabad-Kota and Idlabad-Khandwa-Indore-Ratlam-Neemuch will be constructed. Bombay-Indore, Indore-Bhopal, Khandwa-Indore, Biora-Shajapur-Dewas may have double lines.

Fertilizer and paper industry at Itarsi and forest-based industry at Barwaha may be established with good prospects. At various places industries based on forest wealth, like wood-seasoning plant, veneer plant, lac, gum, straw board mill etc. can be started. Indore has great possibilities regarding dairying, sugar, aluminium foundry and forge plant, rolling mills, copper sulphate etc., while Ujjain can develop agricultural implements, Bhopal may prepare builder's hardware. Nagda may have aluminium sulphate, bleaching powder and caustic soda; Hoshangabad, paper and boards, concrete pipes, coal carbonisation and fertilisers. Handloom industry may be improved. Last but not the least in importance is the tourist industry and centres of recreation like Sanchi, Pachmarhi, Kanha Bagh etc. could be developed and provided with suitable facilities.

Thus the region, bestowed with good fertile land, has great potentiality to be utilized for economic development by improving human resource through liberal and technical education.

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The region ($24^{\circ}00'-26^{\circ}30'N$ and $78^{\circ}10'-81^{\circ}30'E$) bounded by the Yamuna in the north, escarped ranges of the Vindhyan plateau in the south, the Chambal in the north-west and Panna-Ajajgarh ranges in the south-east, is known as Bundelkhand. It comprises of four districts of Uttar Pradesh (Jalaun, Jhansi, Hamirpur and Banda) and four districts of Madhya Pradesh (Datia,

Tikamgarh, Chhatarpur and Panna) together with Lahar (Bhind district) and Bhandar (Gwalior district) tahsils in the north-west (Fig. 15.1) with a total area of about 54,560 km² and a population of about 5.3 million (1961).

Historical Background

The early history of Bundelkhand unfolds itself through traditions, inscriptions and some re-

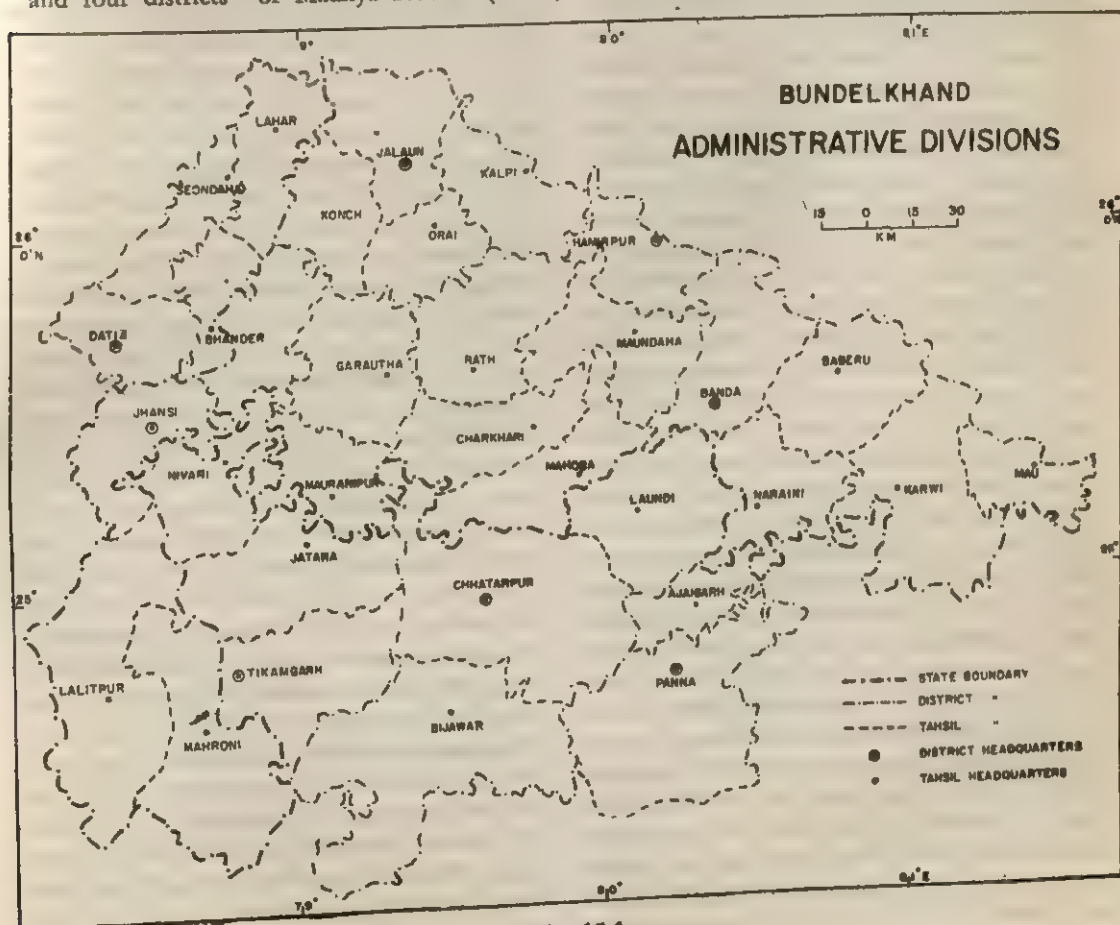


Fig. 15.1

cords of early and medieval writers. These sources strongly suggest that the original settlers and colonizers in this region were the Gonds, traces of whose socio-cultural profiles were subsequently obliterated.

The earliest information about this region dates back to the times of the sixteen *Mahajanapadas* in the 6th century B.C., when one of the Janpadas known as *Chedi* with capital at Shaktimati or Sandhivata, covered a major part of present Bundelkhand and the adjoining areas. During the Magadh ascendancy the region was annexed by the Nandas, and remained part of the Mauryas and the Shungas till the end of A.D. 300, when the Nagas established their rule with Padmavati (modern Pawaiya) on the Betwa as their capital. Samudra Gupta is said to have usurped this area from Vyagra Raj, the ruler of Mahakantar. During much of the period this area remained forested being commonly known as *Jaijak Bhukti*. From 9th century onwards, the region came under the rule of Gurjar-Pratiharas succeeded by the Chandel Rajputs. The Chandels were good warriors and administrators. They constructed strong forts (Ajaigarh and Kalinjar), noble temples (e.g. Khajuraho) and excellent irrigation works. In the 12th century A.D. Parmal Deo, the 20th ruler in succession, fought many battles with the rulers of Ajmer and Delhi and even opposed Muhammad Ghori with a large force. Prithvi Raj Chauhan of Delhi, however, defeated him. After the fall of Chauhan rule the country was exposed to anarchy and to Muslim invasions until the close of the 14th century. Then the Bundelas after whom the region is known as *Bundelkhand* appeared on the scene.¹ They settled first at Mau (Banda district) and then after taking Kalinjar and Kalpi made Mahoni their first capital which was shifted to Orchha founded by Raja Rudra Pratap Singh in about 1531. The Bundelas not only consolidated their power but also considerably extended their kingdom over the whole region between the Yamuna in the north and the Narmada in the south. However, Bir Singh Deo, the great-grandson of Rudra Pratap was compelled to acknowledge himself as a vassal of the Moghul empire, but Champat Rai, another Bundela chief, held

out in the rugged country of Betwa ravines and harassed the Moghul rulers. The guerilla warfare waged by small contingents of the Bundela soldiers never allowed the mighty Moghuls to get a firm foot-hold in the region. The Moghuls, however, continued to enjoy a kind of suzerainty in the region. The success of the Bundela soldiers over large armies was largely due to their familiarity with the terrain (ravines). The Bundelas also controlled the strategic routes to the Deccan passing through this region.

The great Bundela chief, Chhatrasal, who figures so high in the regional folk-lore, was a worthy son of a worthy father, Champat Rai. He ravaged the country held by his enemies in every direction. Later, he was so much pressed by the Bangash Pathan chief of Farrukhabad that he had to seek help of Peshwa in 1734 to defeat him.² The Maratha chief got 1/3 of his territory (Jhansi and Jalaun). Jhansi was wrested by the Peshwa³ from the Raja of Orchha and entrusted to a 'Subedar'. The great Rani of Jhansi, Laxmibai, was the wife of Raja Gangadhar Rao, one of the descendants of this family. She has been credited as being the first freedom-fighter of Indian Independence and to have raised arms against the British. In declining days of the Bundelas, the southern Bundelkhand became fragmented into large number of petty states under the overall charge of the Central India Agency.

It may, thus, be seen that from the beginning of the 13th to the end of the 18th century, Bundelkhand was virtually a cock-pit of constant warfare amongst the regional powers—the Bundela rulers, the Marathas and the Rohillas. The desolating effect of purely predatory warfare was that agriculture was totally neglected and scarcities and famines occasionally deepened the crisis. Chandels, no doubt, had earlier done a great humanitarian job by constructing a large number of tanks but efforts for the stabilization of economy were made with the restoration of order and construction of canals by the British in some areas. The regional economy has been further strengthened by the various projects and land reform measures since Independence.

The Physical Setting

Geology

Four main geological systems represented in Bundelkhand are : (i) The Archaean system, (ii) Transitional system, (iii) The Vindhyan system and (iv) The Recent Deposits.

(i) The Achaean system is represented by 'massif Bundelkhand' which is largely composed of crystalline igneous and metamorphic rocks. In geological literature the typical rock of this region is popularly termed as 'Bundelkhand gneiss', which is a misnomer. In fact, granite and gneiss are both conspicuous in which the former predominates. The origin of massif Bundelkhand is not yet clearly understood as the question of its evolution is inextricably linked up with the very origin of granite over which there is a great controversy at present.⁴ Saxena⁵ believes that Bundelkhand granites were formed in the process of 'replacement' of non-igneous matter, crystal by crystal, by hydro-thermal effects and not by 'magmatic emplacement.' According to him the so called 'black xenoliths' of Kabrai area (Hamirpur district) contain a complete sequence of granitisation and support his views. Jhingaran,⁶ however, suggests that the best solution of this riddle probably lies in accepting the granites of Bundelkhand as having been formed in both the manners. That way the massif can be considered as truly complex. Dubey⁷ assigns an age of 2,300 million years to the regional granites. They are pre-Dharwarian and are next to or even contemporaneous with the oldest Aravalli schists.

Based on texture and composition, several types of granite can be recognised in Bundelkhand. Of these the pink feldsparic, coarse-grained variety is the most dominant in distribution and massive in character, but gray varieties with variable texture are also present. Gneisses are next only to granites in importance. They vary from medium to coarse-grained varieties and lack any fixed pattern in their distribution. The gneisses of Kabrai area are hybrid whereas that of western periphery are 'bedded' ones, which had been

subjected to powerful external forces from the westerly direction, and are hence slightly folded and largely fractured.

(ii) Gwalior Series appearing in the northern part of Datia district and Bijawar Series in Bijawar tahsil of Chhatarpur district are often referred to as Transitional Systems having been formed in the post-Aravalli or pre-Vindhyan period. Both of these series represent sedimentary strata of sandstones and limestones in which lava intrusions had later penetrated. Bijawars present a contorted arrangement of very hard and soft rocks and are chiefly composed of massive quartzite sandstones and granitic sandstones.⁸

(iii) The Vindhyan system forms a girdle around Bundelkhand granites in a semi-circular fashion except in the north. In the region, the Vindhyan system forms a series of posing escarpments of massive sandstone and limestone, which were originally deposited in a shallow but extensive basin. As a result of isostatic adjustment in the southern part, and tectonic movements in the western part, massive escarpments of the Vindhyan sediments rose up to somewhat isolate the country of Bundelkhand from the south and south-west. No wonder, therefore, that these escarpments became the traditional socio-cultural boundary between North and South India and played an exceedingly important role in shaping the Nation's history.⁹

In Bundelkhand, it is chiefly the lower Vindhyan which are found in the form of Bhandar, Rewa and Kaimur series and while shales are best developed in the centre, sandstones are exposed along the borders. In the north-west and north-east the system is covered by Ganga-Yamuna alluvium and in the south-west by Deccan Trap. Upper Vindhyan were profusely intruded by lava dykes and sills.

(iv) Recent Deposits in Bundelkhand are represented by large scale alluvial deposits in the form of an 'embayment' into the granite country. The alluvial sediments are of fluvial and subaerial formations of sand, silt and clay. The texture of the deposits becomes more and more refined as we proceed towards river Yamuna from south-central granite country. In the south the

surface is strewn with granite boulders and stony wastes (Fig. 15.2).

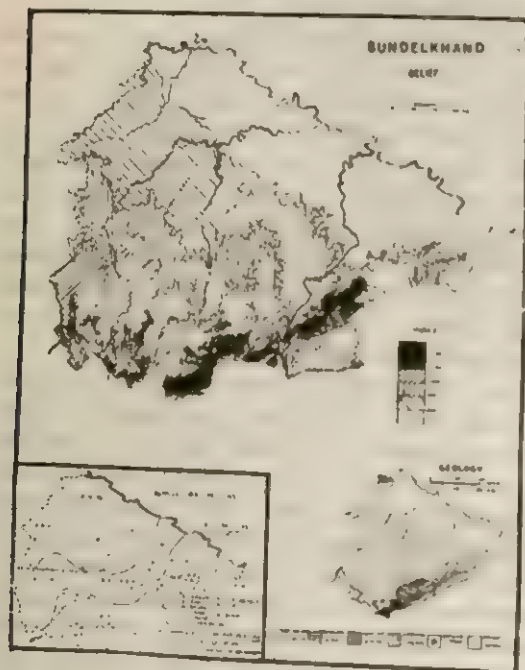


Fig. 15.2

Relief

The keynote of Bundelkhand topography is its smooth and undulating character to which Spate gives the term 'senile topography'.¹⁰ With the exception of southern marginal areas which still retain the features of a dissected plateau, the entire region is marked by subdued topography that tends to grade into a perfect level plain towards north. The hypsometric curve of the region shows that about 67.7% of the area is under 300 m and only 3.6% is above 450 m; the rest is between 300 and 450 m.

The northern 1/3 of the plain area is monotonously flat and stands in strong contrast with the Vindhyan tableland which rises in three well-marked escarpments roughly delineated by 300, 375 and 450 m contours. The south-central granite country forming as it were the nucleus and providing the basement for the entire structural build to the region, varies in elevation from 300 to 366 m. It shows everywhere gently un-

dulating surface with occasionally flat-topped hills of smooth sky-line as relics of peneplanated surfaces. The monotony of low relief of the granite country is frequently broken by quartz reefs and dolerite dykes surrounded by plethora of boulders dislodged from them.

The main streams of the region, namely the Betwa, the Dhasan and the Ken, with their affluents have everywhere, specially in the south, carved out steep gorges and precipitous rocky banks and often descend through magnificent water-falls, some of these being 60 m high. On entering the alluvial plain in the north, these streams engage themselves in active erosion on a very large scale to form some of the most extensive and fantastic ravine lands.

Vindhyachal range, the average elevation of which never exceeds 600 m, actually begins from Seondha tahsil of Datia district in the north-west and approaches Narwar due south. From Narwar it turns south-east and further north-east to reach erstwhile Ajaigarh and Kalinjar states. The tableland, which lies behind this escarpment is 16 to 20 km broad and may be termed as Bijawar-Panna plateau because of its maximum expansion in that area. Geologically, it includes Gwaliors, Bijawars and Vindhyan sandstones with lava intrusions; as such, it has resulted in the excavation of intricate and irregular valleys of which shading on the map gives no idea. The common rocks are sandstones, limestones and shales which all change their characteristics with the change in their strikes.

In the west, the Vindhyachal range is very narrow and cut-up into isolated hills. The Vindhya extends to Lalitpur tahsil near Deogarh where the Betwa has cut through a magnificent gorge. As elsewhere, the plateau in Bijawar and Panna district is also marked by bevelled summits and steep valleys. Panna and Ajaigarh ranges "are mere prominences left standing while the surrounding parts have disappeared in the prolonged denudation which these regions have undergone."¹¹

The Bijawar-Panna plateau terminates abruptly beyond the northward-facing scarp of Vindhyachal and Panna ranges. Further north-west lies a

vast country of granites and gneisses covering mostly the area of Jhansi, Tikamgarh, Chhatarpur and southern margins of Banda and Hamirpur districts. Sub-aerial denudation has reduced the granite country into an undulating surface of moderate relief with characteristics of late mature landscape. The peculiar features of immense geomorphic interest in this region are the long narrow serrated ridges termed as quartz reefs and dolerite dykes. The former are made of cherty material of quartz mixed with microcline, perthite and feldspar. They are made of compact and weather-resistant material which has been further strengthened by hydro-thermal metamorphism and by filling-up of joints by subsequent intrusive materials. Quartz reefs are very conservative in their direction and persist for long distances like fort walls. They have frequently intercepted the courses of regional streams, and thereby have provided suitable sites for large number of water bodies and semi artificial tanks giving relatively greater security to agriculture.

Bundelkhand Plain, also known as Trans-Yamuna plain, is made of the soft and unconsolidated materials brought down by the tributaries of Yamuna, Chambal, Betwa, and Ken. These deposits extend upon the granite surface for about 110 km along 80°E longitude. Its average elevation is below 150 m. Topographically the whole plain is divisible into three east-west running belts of varying width. The southern belt is typically a transitional area, roughly marked by Chirgaon-Garautha-Rath-Matand-Banda line, north of which surface boulders are absent while in the south their preponderance is significant. The central belt with imperfect drainage extends to the southern bank of the Yamuna. The third belt, the narrowest of the three, is confined along the banks of the Yamuna in the form of 'high ground' which represents the level of the ancient flood plains but which at present is badly cut up into deep ravines. Such ravines also extend along the tributary streams of the Yamuna.

Drainage

Bundelkhand is drained by the Yamuna system (Fig. 15.3). Yamuna is the biggest stream and

the Betwa, Ken and Baghain are its main tributaries; Dhasan is a tributary of river Betwa. These streams are fed by innumerable seasonal torrents. The southern bank of the Yamuna, being 15 to 45 m high does not permit the diversion of its natural flow southwards and as such, more important than Yamuna are the Betwa, Ken, Pahuj and Dhasan streams for irrigation in the region. The average annual discharge of river Betwa is about 815,000 cusecs and that of river Ken is only 800 cusecs but their seasonal fluctuations are abnormal, e.g. the discharge of river Ken in winter is reduced to only 300 cusecs and in May it dwindles to practically nothing. Such fluctuations undermine the security of irrigation.

The well-known waterbodies of Bundelkhand are Pahuj reservoir, Barwa sagar, Barwar lake, Siaori lake, Pachawara lake, Dakwan and Parichha reservoirs, Arhar tal, Manikpur tal, Majhgawan tal, Bela tal, Raipura sagar and a host of other tanks around Mahoba. In Tikamgarh, the famous tanks are Madan sagar, Nandwara, Bir sagar and Arjar lake. In Chhatarpur district, Jagat sagar, Gora tal and Gangau reservoir are well-known. Matatila, Lalitpur and Saprar are new reservoirs constructed in the post-Independence period.

Climate

Centrality of the region imposes on it the features of a transitional climate between the maritime climate of the east coast (Bay of Bengal) and the tropical continental dry type of climate of the west (Rajasthan).

The average annual temperatures of Bundelkhand are uniformly high (over 25°C). The mean annual temperature of Orai is 22.5°C, that of Jhansi 26.5°C and Nowgong 25.5°C but their mean monthly values considerably vary from their annual means and consequently their ranges are high (17.5° to 21.5°C).

The mean annual precipitation varies from 75 cm in the north-west to about 125 cm in the south-east; the average may be taken as 100 cm of which 90% falls between June to September. Some shallow westerly depressions cause some winter precipitation.



Fig. 15.3

The mean seasonal temperature in summer varies from 29.5°C to 32.0°C , but actual temperatures are much higher and mercury often records 38.0°C or more when heat becomes oppressive accompanied by scorching winds. District Band often registers the largest number of sun-strokes every year probably owing to intense terrestrial radiation and lack of haziness in the sky, being away from the source regions of dust storms in the west. Nights are also hot with temperature seldom going below 15.5°C . Local storms often give the region one or two pre-monsoon showers followed by lightning and hail and cause damage to the harvest in March and April. Relative humidity during summer varies from 30 to 40% (Fig. 15.4).

With the advent of summer monsoon by the middle of June, regional temperatures fall abruptly by 5.5°C giving a sense of general relief. The mean seasonal temperatures during rainy season are between 22°C and 25°C with relative humidity varying from 70 to 80%, so that the typical weather during July and August is muggy and sultry. July and August are usually the rainiest months each with about 30 cm of rain followed by September (15.5 cm). Thus, about 75 cm or (75%) of regional precipitation is concentrated in three months only, but the monthly budget is highly variable and capricious. It is this uncertainty which is notoriously responsible for a large number of famines, scarcities and deluges which have been the lot of the region since times immemorial.

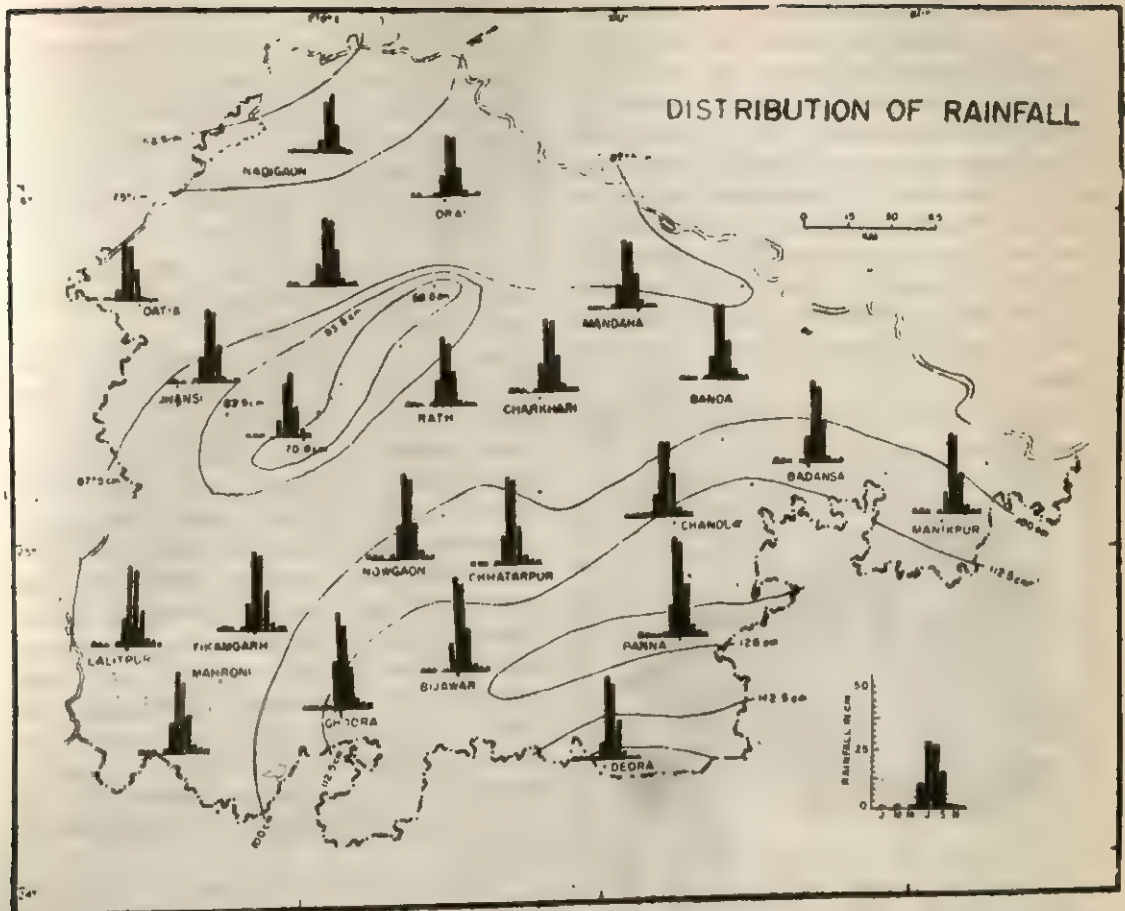


Fig. 15.4

From October onward to February, the weather gradually crystallises into a pleasant and invigorating winter season with average temperatures varying from 16.5° to 21.0°C . Nights are frequently chilly and frosts occur specially when cold wave sweeps the region from west or north-west. The winter rains are beneficial to the *rabi* crops. From April onward the weather rapidly becomes warmer, and hot and dry season finally sets in.

Natural Vegetation

Bundelkhand, anecologically degraded region, has an estimated area of 0.64 million hectares under forest (7.2%¹²). Teak is found in small patches. *Dhak*, *semal*, *salai*, and *babul* are the

principal types of acacias. *Khair* is a common tree but not much utilized. *Hingota*, *karondha* and *kareel* are mostly utilised for grazing. *Tendu* trees are found in abundance in Panna and Chhatarpur districts. In Jalaun, Hamirpur and Banda districts the original cover has almost been removed to make room for cultivation.

Scrubs and grasses represent the secondary growth throughout the region. They are specially extensive in western parts of Jalaun, Datia and Jhansi owing to dry climate and stony surface. Grasses of various kinds such as *musel*, *uara*, *gunaa*, *katta*, *pasai*, *dula*, *kans*, *dakh*, and *gandar*, etc., grow profusely in the rainy season. Of these *musel*, *uara*, and *gunar* are useful for animals but unfortunately they all grow on black soils:

Kars is one of the most pernicious perennial weeds difficult to eradicate. Some of the best known grasses of Bundelkhand grow over eastern hills. Famous Kalinjar grasses are leased out annually and supplied to military centres. There are also military grass farms near Bairagarh and Jhansi and an average of 25,926 quintals of hay is annually cut from these reserves. It is needless to emphasize the significance of the forests and grasslands in providing fodder for cattle, and as such, the Indian Grassland and Fodder Research Institute has been set up at Jhansi.

Soils

Bundelkhand soils may be conveniently grouped into the following categories (Fig. 15.5):

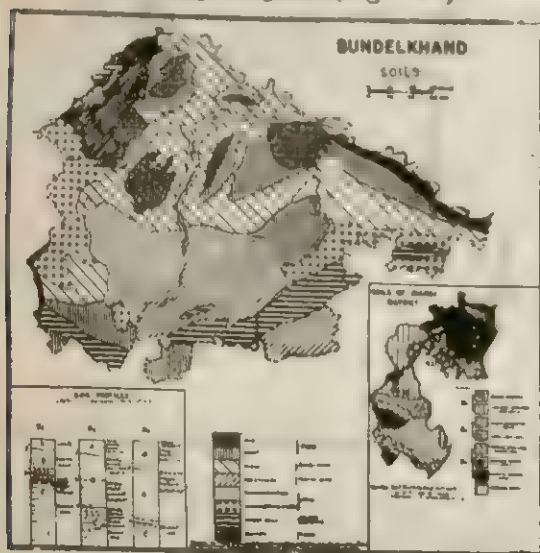


Fig. 15.5

1. Upland soils : (Rocky soils) 2. Lowland soils : Black soils (*Mar*, *Kabar*) and Red and Yellow soils (*Parua*, *Rankar*). 3. Riverine soils : *Kachbar* and *Tari*.

The upland soils mostly *in situ* are found on the Vindhyan plateau. In Banda district these are termed as *patba* soils and include poorer forms of *parua*, *mar* and *kabar* soils with texture varying from clay loam to sandy loam.

The most important soil groups of Bundelkhand are found in the northern lowland. These are *mar*, *kabar*, *parua* and *rankar*. Formed

partly *in situ* and partly by transporting agencies, chiefly the streams, they exhibit a mosaic pattern.

Mar is a calcareous soil predominantly blackish in colour, mixed with lumps of *kankar* and hence friable and acrated. It is highly moisture retentive which makes it highly prized for cultivation of wheat, gram and sugarcane. *Kabar*, on the other hand, is highly diffused soil and is similar to *mar* in many physical characteristics except that it is extremely compact and tenacious without lime concretions.

Red soils have developed over granites and gneisses which are undoubtedly their parent rocks in western Bundelkhand, especially in Jhansi district. In eastern Bundelkhand they are associated with sandstones. Red colour of these soils is specially deep over gneisses and grades into brown, chocolate, yellow or grey with varying amount of iron, degree of slope and distance from exposed gneissic surfaces together with the amount of their admixture with black soils. *Parua*, the best known variety of degraded red and yellow soil group, is well acrated, friable and receptive to irrigation and, as such, a prized soil for various types of crops. Chemically, however, it is deficient in iron, phosphate and nitrogen. As alkali content is usually high, over-irrigation is harmful.

Riverine soils contain fragments of many types of rocks and grade from coarse sand to fine clays. In official records they are conventionally divided into *Tari*, *Kachbar*, and *Rankar*. *Tari* is found adjoining the channels and the shelving banks are covered with *kachbar*. On the other hand, the *rankar* is associated with higher flood plains subjected to gullying and erosion so that calcium nodules are exposed at the sloping surfaces, rendering them unsuitable for cultivation.

Apart from the above, mention may be made of the soil survey and soil-work completed by the U.P. Government in Jhansi district during the years 1951-52-53.¹² The findings are of considerable importance for the Bundelkhand region as a whole. The soils of the district were classified into three main genetic types denoted as Bundelkhand type 1, Bundelkhand type 2, and Bundelkhand type 3.

Minerals

Diamondiferous bed in Panna district lies between the Rewa and the Upper Vindhyan series and upon the Kaimur sandstones. At the time of Vredenburg's survey, there were 36 localities producing diamonds, out of which 24 were in Panna State (96 km×16 km). At present the volcanic pipe at Majhgawan is the only source of diamond, the annual yield being about 30,000 carats and being highly variable. The estimated reserve is about 4.62 million carats.¹⁴

Bundelkhand is, however, rich in building stones such as granite, sandstone and shale. Numerous forts and fortresses made of these stones testify to their usefulness for structural and monumental purposes, but they are so heavy as to discourage distant transportation, hence locally used.

The iron pockets, associated with the Gwaliors and Bijawars and which were once exploited by Bundela chiefs for their armament, are now exhausted and mining is abandoned. Agates of great beauty and variety are found in the bed of the Ken, known as 'Banda stone'.¹⁵

The Cultural Setting

Population

The total population of Bundelkhand is 5.3 million (1961). In its historical perspective, this size has been attained as a result of a slow growth of population at an average rate of 0.75% per annum since 1901. The maximum growth rate, however, was witnessed during 1951-61 (2.25% per annum) as a result of which the total population increased suddenly from 4.03 million to 5.3 million. This period synchronised with good harvests coupled with influx of refugees from Pakistan. The preceding decennial period, on the other hand, recorded a minimum growth rate, i.e., 0.48% per annum and the period between 1911 and 1921 was conspicuous by actual decline in the numbers when heavy losses of life took place as a result of epidemics such as cholera and influenza. In 1905-07 Bundelkhand was severely hit by one of the worst famines so that population of Banda and Jalaun districts was reduced to half by successive waves of migrations to other parts in Uttar Pradesh.

The average annual growth rate of population in Bundelkhand for the last 60 years is low as compared to Madhya Pradesh and Uttar Pradesh as a whole. However, it is not uniform, being maximum (1.0%) in Jhansi and minimum (0.67%) in Datia. The reasons for this slow growth may be sought in natural checks such as high death rates and frequency of droughts and scarcities. Nevertheless, it has affected the man-land ratio considerably. Thus, while the per capita net cultivated area in 1951 was 0.55 hectare (1.36 acres) within 10 years it came down to only 0.47 hectare (1.15 acres). By now, it must have been further reduced to 0.41 hectare (1 acre) only.

The earlier pattern of population distribution in Bundelkhand is still discernible on the map which shows that people are more or less evenly distributed in the northern plain ever since its occupation but in the south distribution remains patchy in character as the people here rigidly cling to favourable localities only as a consequence of dissected relief and impoverished soils (Fig. 15.6).

The following table (1) shows the values of arithmetic, agricultural, physiological and nutritional densities in Bundelkhand :

TABLE 1
Density of Population (per km²), 1961

District	Arithmetic density	Agricultural density	Physiological density	Nutritional density
Jhansi	107	219	325	340
Jalaun	144	156	182	195
Hamirpur	110	161	168	184
Banda	119	194	208	218
Datia	98	143	169	181
Tikamgarh	90	290	303	340
Chhatarpur	67	219	240	289
Panna	50	195	203	241
Lahar-Bhandar enclave	129	182	215	380
Region	101.5	195.4	223.3	241.0

In Bundelkhand, comparatively higher densities of Jalaun, Hamirpur and Banda are the result

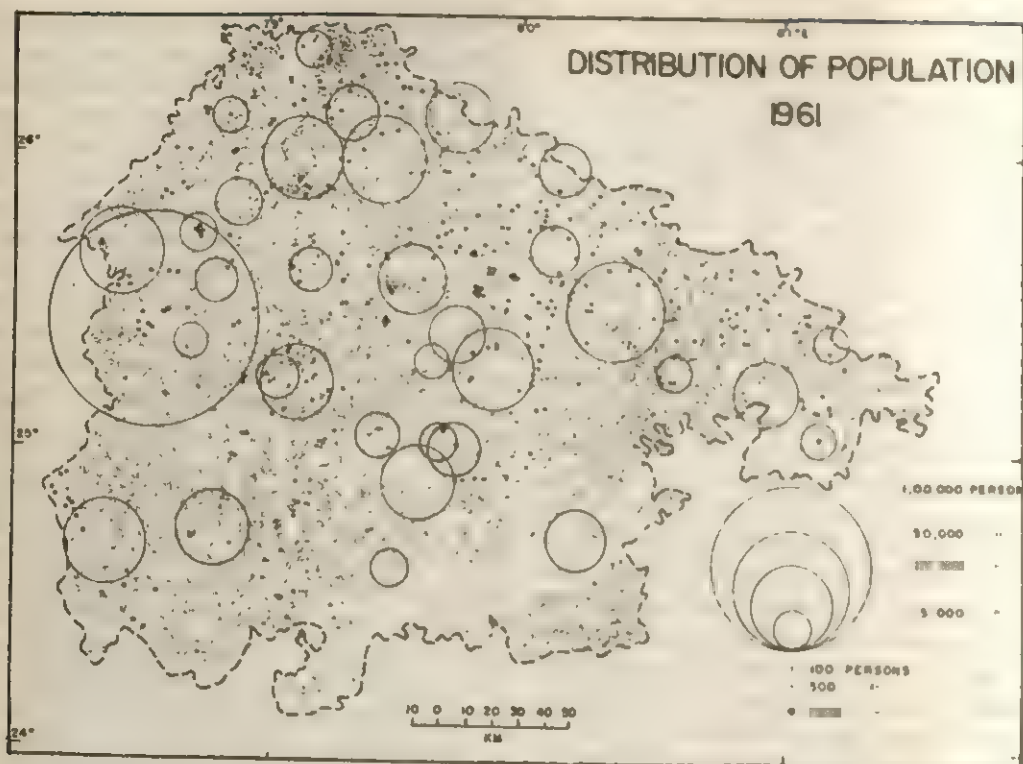


Fig. 15.6

of early settlement and richer soil resources. Measures such as irrigation, improved crop combination and drainage improvement have all helped in increasing agricultural potentials and permitted more and more absorption of people than it could be otherwise possible. Of all the units of the region, Jhansi tahsil stands out for its high density owing to the presence of Jhansi city which is incidentally the most important and the only urban centre of consequence in the whole region.

Qualitative Attributes of Regional Population : In Bundelkhand there are 905 females per 1,000 males, the maximum (925) being in Hamirpur district and the minimum (886) in Jalaun. Statistics on sex ratios since 1901 show a continuous decline in the number of females throughout the region. This tendency is comparable to several regions in the country.

A study of the age groups of population suggests that 32.4% of the total population belongs to the age group, 15 to 34 years, and it constitutes 50%

of the working class, specially agriculturists and agricultural labourers. Children below 15 years form 40% of total population and 6.6% of the total labour force. The people of the age group 35 to 59 years account for 22% of the total population and 57% of the total working force. A very small percentage of the population is 60 years and over in age.

The workers as a whole constitute about 46.6% of the total population. About 31.1% of the people are cultivators followed by agricultural labourers constituting 5.3% of the total working force. The remaining are spread over other sectors of the economy. These figures, therefore, clearly suggest that the employment avenues are not diversified, and even agriculture is over-burdened.

Bundelkhand, with 89% of people living in villages, is overwhelmingly rural in character. Even the bulk of people living in the towns are basically rural in out-look and life. The highest

urban population (24%) in Jhansi district is owing to the presence of Jhansi group of towns, followed by Datia (14.68%), Jalaun (12.80), Chhatarpur (9.50) and Tikamgarh (4.5). Low percentage of urban population in the region reflects the character of its undeveloped industrial economy.

Settlements

Historical evidences strongly suggest that the systematic colonization of this region started only after the rise of the Chandel Rajputs about A.D. 1100. Previous to that it was settled in isolated patches by certain tribes such as Gonds, Kushwahs, etc. The population was confined to either forest clearings or along the main routes of movement. The region was subjected to three-pronged penetration by the people from outside. Probably Trans-Yamuna region in the north was the first to gravitate people from the Ganga plain, Kalpi being founded between A.D. 330 to 400,¹⁶ and the waves of immigrants progressively moved southward. Then the people coming from north-east to south-west with centres at Mahoba and Narwar respectively moved in. Forests were indiscriminately cleared for cultivation, and with growing pressure of population the use of the resources could not be properly adjusted to the demand.

The people of Bundelkhand largely dwell in villages, majority of which are small in size and monofunctional in character. They represent a group of mud-houses huddled together in a more or less compact area situated in the midst of the fields. The farmstead type of settlement is entirely absent. There is obviously little link between the houses of the individual cultivator and the fields he tills.

Villages of the districts of Jhansi division are of varying shapes and sizes. The inter-village distances are greater here than in the Ganga plain. Clusters of houses are perched on elevated sites, the substantial nature of which often lends an air of solidarity and strength. Villages, situated on hillocks, present a fort-like appearance. In areas intersected by streams, dispersed types of small clusters are found.¹⁷

In the region as a whole there are about 83,000

inhabited villages of varying sizes ranging from less than 200 persons to 10,000 persons or more. It is significant to note that over three-fourths of the regional population is lodged in villages with 200 to 2,000 persons. Villages having less than 500 people are specially numerous in southern part of the region where dissected relief and unproductive soils favour dispersion of dwellings as well as the settlements. There are, on an average, 97 persons per km², 1 × 5 villages per km², 650 persons per village and about 5 persons per household. The rural house is primitive in appearance, irregular in shape and crude in construction. It is usually small and unhygienic. Based on 20% of random sampling it has been found (1961 census) that one-room houses for every 1,000 census houses are 356 in Jhansi, 160 in Jalaun, 220 in Hamirpur and 280 in Banda district. On the basis of the above data it may be safely deduced that in the region as a whole 25.6% of the census houses are one-room and the same percentage is true of two-room houses. The average density of one-room houses is four and that of two-room, five persons and out of the total population of the region roughly 40% live in one-room houses.

In shape these dwellings differ considerably, but in their general ground plan they are roughly rectangular. The thatched or tiled roof rises in the centre and covers the parallel walls at an angle which varies from 25° to 40°. The constructional material of their walls and roofs affirms their overwhelming dependence on the local resources. Walls are generally made of mud or burnt bricks. In Jhansi division out of every 1,000 houses, approximately 856 have mud walls and 142 burnt brick walls. Roofing material varies from place to place but the region as a whole is chiefly characterised by mud tiles prepared from clays collected from local tank beds. In Jhansi division 923 out of every 1,000 houses have tiles or stone slabs, or both.

Morphologically it is possible to discern a kind of rough zoning in the land use pattern of Bundelkhand village. In general the nucleus of the village is the *abadi* area occupied by farmers' dwellings, each having one or two *room* trees

whose cumulative dense growth often signify the presence of the village when viewed from some distance. *Abadi* is often surrounded, on one or two sides, by an orchard zone of mango groves while on the other side is the tank fringing the village. Beyond these, lie the fields given to grain farming, often cut across by a tongue of village forests or radially penetrated by cart tracks. At the outer fringe of the village is the zone of pasture land called *Maida* which also act as the boundary between two villages.

Urbanisation and Urban Centres

Being predominantly agricultural, the progress of urbanization in Bundelkhand could not make much headway. In fact, leaving Jhansi and a few more centres, no settlement is worthy of being termed as truly 'urban'. They are rurban and have acquired significance merely as service centres administrative headquarters or fort towns of erst-while feudal chiefs. None of them bears the stamp of modern urban function.

In all, there are at present 30 towns in Bundelkhand, of which 20 are in U.P. and 10 in M.P. Jhansi group of towns is of some significance. Jhansi (1.7 lakhs) is the largest city of the region with a big cantonment and railway workshop. The city bears an unattractive look, which was built by Bir Singh Deo. The famous historic fort constitutes the nucleus around which the settlement of Orchha towards the closing years of the century grew. The fort and the township were ravaged by Moghul armies in 1602. The city of Jhansi practically owes its development as a large town to Malhar Krishna Rao, one of the Maratha generals of Nuru Shanker of Malwa, whose troops had marched on the way up north to Orchha in A.D. 1742-43.

In 1881, Jhansi city had a population of 2,473 persons only. The population has repeatedly suffered several setbacks. In 1901, the population stood at 55,724. Within the next 50 years it rose to 127,365 i.e. about two and half times. The increase between 1951 and 1961 was almost phenomenal (33.25%).

The increase in the population, however, did not change the basic pattern of the city layout. Its

sparingly settled and unplanned character (leaving railway colony and cantonment) is the result of local relief. City roads, usually narrow and zig-zag, are lined by old fashioned but strongly built houses.

Lalitpur town (1961 Pop. 25,220) : The defensive spot with river frontage and raised surface appears to have been the most important site for the urban nucleus of Lalitpur. It is bounded by river Shahjad on the east and *Biana nala* on the north. The crossing of the river Shahjad by Jhansi-Sagar road at Lalitpur has led to convergence of several minor roads to this place.

Services are dominating occupational group while trade and commerce, household industry and transport engage 20.1, 18.4 and 9.7 per cent respectively.¹⁰

The principal shopping area of this town is hardly a compact business zone though it forms the focus of arterial routes. The business areas are generally encircled by residential areas and in many cases the high class residences are located in the outer areas. The residential areas occupy a large part of the total settled area. Those lying in the inner zone are older in origin and consist of congested, out-dated and two or three storeyed buildings with narrow lanes. As one moves towards the middle and outer zones, the vertical extent of the building goes on decreasing, roads widen and houses become more spacious and comfortable. Thatched huts and tiled houses become a regular feature at the outskirts for the lower classes.

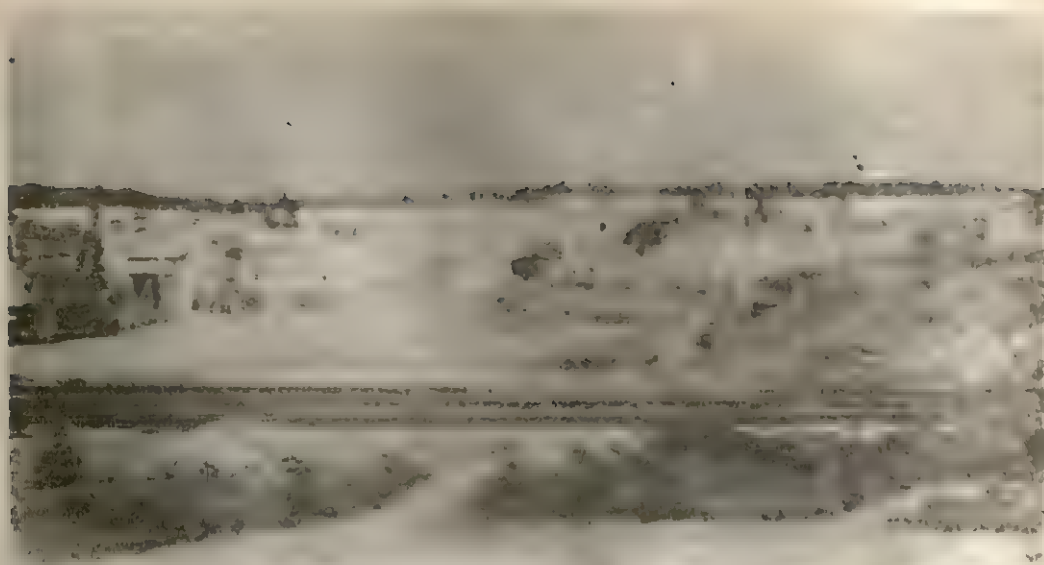
The town of Lalitpur is surrounded by ill-drained, lowlying tracts on its northern, eastern and southern sides owing to the presence of *Biana nala* and the Shahjad. As such, the middle class residential areas have developed in the form of a compact block just around the business zone and, thus, a well-marked core is formed. The widely spaced government bungalows occupy the raised sites in north-western sector. The other spacious and good looking buildings, which are more recent in origin, have followed the roads leading to Jakhlon and the railway station. The poor class residences are chiefly located either close to or beyond the *Biana nala* in the north



The famous Khajuraho Temples



River Yamuna at Kalpi : this bridge gives Kalpi the privilege of being called "the Gateway of Bundelkhand"



A view of Renukut—A Newly Developing Township near Rihand Dam in Sonpar



Kanhar Valley in Sonpar

and at the outskirts of the middle class residential block in the east.

The administrative areas comprise the forest, irrigation and P.W.D. offices along with a jail. All of them, though widely scattered, are confined to a single sector radiating north-westward from the business core. On the other hand, all the iron foundries and oil mills have sprung up beside the railway station road.

In Jalaun district Orai (29,587) being the district headquarters, is the biggest town with railway station, a post-graduate college and other district offices. Konch, Kalpi and Jalaun are tahsil headquarters and rural service centres. Banda has four towns namely Banda (37,441), Chitrakut-Dham (15,220), Manikpur (5,408) and Rajapur (5,089), while in Hamirpur district, Charkhari (13,385), Hamirpur (10,921), Rath (17,419) and Mahoba (24,878) are mostly the seats of several ancient dynasties.

Chitrakut-Dham? The town of Karwi has emerged on a site where the marshy valley of river Paisuni is crossed by the Allahabad-Banda road. Prior to the days of fast transportation, this site was used as an encamping ground for both military as well as civilian traffic. To cater to these camps, small markets were established which acted as nuclei for later urban developments. Karwi is now (1961) a part of Chitrakut-Dham totalling a population of 15,220, though actually they are separate units. The siting of Chitrakut-Dham has been on the religious ground. The town has grown on the western bank of the Paisuni (locally the Mandakini Ganga) close to the fort of the Kamta Hills. The place has been highly sanctified with the association of Rama. Chitrakut-Dham is isolated, being girdled on three sides by rivers and Kamta hill. As such, the town has not been able to attain a good urban size (Fig-15.7). The largest proportion of the gainfully employed workers is in 'other services'. Trade and commerce, agriculture and household industry are almost equally important.

In Chitrakut proper the commercial quarters are studded in the form of a semi-circular belt along the Karwi road. The shops are small in size and deal in religious articles, *parchnus* and

wooden toys, all meant for pilgrims who visit the place daily in large numbers. At Karwi, three distinct business areas are visible each of which forms a separate nucleus. Tarahuwan and old Karwi belong, on the basis of origin, to the ancient and Maratha periods of the Indian history respectively. The Nai Karwi Market followed the railway (1812) and has enjoyed a fast growth as the large trade of Rajapur (on Yamuna) was diverted to Karwi due to decreasing importance of water transport. The place holds a good grain market, particularly for pulses, gram and oilseeds.

The residential areas form four widely separated units, viz., Chitrakut, Tarahuwan, old Karwi and new Karwi. The first three units, being older in origin and falling out of the way, lie in a desolate condition. The houses are generally built of mud walls and country tiles. The conditions are quite different at new Karwi, where most of the residential houses are middle class consisting of pucca buildings.

In M. P. (Bundelkhand) urban population (122,955) is only 7.7% of the total. District headquarters such as Datia (29,430), Tikamgarh (20,469), Chhatarpur (22,146) and Panna (16,737) are the chief towns. These fort towns were the headquarters or the capitals of former feudal states. In addition to district and tahsil centres, there are a large number of smaller service centres, i.e., places of weekly markets. For much of central and western Bundelkhand Jhansi wields the maximum influence as a regional capital.

Agricultural Economy

Notwithstanding the fact that regional population overwhelmingly depends on agriculture for its sustenance, Bundelkhand is one of the most under-developed regions of India with traditional and rudimentary forms of cultivation oriented to production of cereals. Some of the causes of backwardness may be attributed to unfavourable physical conditions as a result of which only 46% of the total reported area is under effective cultivation (Table 2). Much of the regional backwardness is further perpetuated by inefficient and traditional methods of farming.

no specialization in the cropping pattern to any considerable degree. Sometimes as many as 27 different crops may be grown in the year.

Kharif and *rabi* harvests cover 1.14 and 1.50 million hectares respectively. Past statistics¹⁹ show that originally *kharif* crops were dominant throughout the region, but now these are out-ranked by *rabi* crops owing to the introduction of canal irrigation, especially after 1912.

Cropping Pattern : Cereals and millets are grown over 62% of the gross cropped area, whereas pulses occupy 26.4%, fruits and vegetables 0.3% and others 3.1%. Among the non-food crops oilseeds, the most important, are grown over 6.5% while 1.5% of area is shared by fibres and spices, etc.

Among the cereals, wheat is the chief *rabi* crop and is grown over 24.0% of the net cropped area. About 2/3 of wheat comes from irrigated tracts of loamy soils of northern Bundelkhand which produces the *Pissia* or the white variety. However, the most popular variety of wheat grown is the drought-resistant *Kathia* (red brown). Rice is sown over 8.0% of the gross cropped area

and except in Banda and Tikamgarh districts, where irrigation is plentiful either from canals or from tanks, it does not form an important crop anywhere else. Barley, in contrast, is widely diffused because it is more adaptable than wheat.

Jowar and bajra are the chief millets of the region and are grown in *kharif* season entirely as un-irrigated crops. Bajra, owing to its requirement of well-drained sandy loams, is confined to Jalaun district. Jowar like barley, however, is more widespread on account of its natural adaptability.

One of the significant features of the cropping pattern is the system of mixed sowing of seeds used as a device to ensure the crops from total failure. The most popular crop associations are wheat and gram (*birra*), wheat and barley (*gojai*), gram and barley (*bejhar*) and jowar or bajra and arhar. The popularity of mixed sowing may be judged from the fact that their combined area is about nine times the area of wheat, seven times of gram and twenty times of barley. Most of the mixed crops tend to include a leguminous crop²⁰ (Fig. 15.2, Inset).

TABLE 2
Land utilization in Bundelkhand by Districts ('000 hectares)
(1959-60 to 1963-64)

Districts	Jhansi	Jalaun	Hamirpur-Banda	Tikamgarh.	Chhatai pur.	Panna	Lahar-Bhander enclave.	Datia	Total	%	
Category											
Total reported area	1,013.6	453.6	711.2	792.8	499.2	852.8	865.2	173.5	201.2	5,563.7	100
Forests	103.2	27.6	30.4	93.2	54.0	42.4	174.8	..	24.2	549.0	9.8
Area not available for cultivation.	104.4	46.0	74.4	88.4	85.6	146.4	121.2	20.4	23.2	710.0	12.7
Other un-cultivated land excluding Fallow lands.	8.0	2.8	2.4	6.8	104.4	130.8	202.0	11.7	6.0	474.1	8.5
Fallow lands	117.6	10.8	58.8	64.4	39.2	175.2	83.2	1.1	22.8	572.7	10.3
Culturable waste-lands.	248.0	15.6	77.6	85.6	62.4	117.2	112.0	3.8	7.6	729.8	13.1
Net sown area	432.4	350.8	476.6	454.4	153.6	240.8	172.0	136.5	117.6	2,528.1	45.5
Area sown more than once	36.8	11.6	16.0	89.2	34.4	28.4	19.2	0.2	2.4	238.2	...

Source : Season & Crop Reports of U. P. and M. P.

In U. P. portion, although the general pattern remains basically food-oriented, some significant changes have taken place during last 100 years. Crops like sugarcane, gram and potatoes have increased in acreage while indigo, opium and cotton have lost ground. Pressure of population has also played significant role in gradually displacing these crops to make room for cereals and other food-crops.

The cropping pattern may be exemplified by a village named Malehra which is located along the Mahoba-Chhatrapur road in the Mau Tahsil of Jhansi district (Fig. 15.8). Agricultural land is put under different crops, viz., wheat, barley, *Bajra*, betel, jowar, gram, oil-seeds, fruits and vegetables, rice, *urd* and other pulses.

Irrigation : Stabilization of agriculture in Bundelkhand has been achieved through fighting back an almost lost battle against the recurrence of droughts, scarcities and famines, for which the region had been ill-reputed. The earliest attempts at providing irrigation by tanks were made by Chandel and Bundela chiefs. In fact, many of the tanks in Bundelkhand are older than the date (Samvat 1604) inscribed at the Hathatpura rock.²¹ However, the real credit for large scale irrigation works (canals) goes to the British who succeeded in constructing the Betwa, Dhasan, Ken and other protective canals. In the post-Independence period, completion of Matatila, Lalitpur, Saprar dams etc., by U. P. Government at a cost of more than Rs. 7.5 crores, was another commendable



Fig. 15.8

landmark in agricultural stabilization. In M. P. Bundelkhand, however, little could be done, owing to repeated political changes and limited financial resources and out of six minor projects submitted to the Planning Commission only two, namely Nandanwara and Beniganj, were executed.

In the pre-canal period (before 1880), wells and tanks were the major sources of irrigation. The undulating nature of the rock strata and the varying thickness of the softer soil deposits cause water to be found at varying depths, from about 3 m in the red soil tract to about 22 m or more in the northern parts. On the river banks of the Betwa and Dhasan the level is deeper. In the neighbourhood of canals the rise in the spring level has been well-marked.

Apart from the above, concentration of wells along road or within a certain locality is a characteristic feature of the region, as is seen in the Malchra village. The tanks were and are still in use in much of Jhansi, Tikamgarh and Chhatarpur districts, where a firm geological formation and undulating surface provide ideal conditions for their construction. However, most of these tanks are shallow and suffer from rapid evaporation, which is roughly 1.8 per year.²² Casually they do not get even full supply of water owing to weak monsoons and as such, they have lost much of their direct value though they are still important for raising water table around them. Large lakes namely, Barwa sagar, Pachwara, Magarwara, Kirat sagar, Madan sagar, Kachneh etc., collectively impound about 1,721 million cu. ft.²³ of water annually but only about 1/3 of their potential is utilised for irrigation.

The most important sources of irrigation in Bundelkhand at present are the canals which irrigate about 0.25 million hectares accounting for 66% of irrigated area. While Betwa and Pahuj canals irrigate the north-western part of the region, the Ken canal serves the eastern and the Dhasan the central tract. These canals, as a whole, command an area of about 0.67 million hectares,²⁴ but they normally irrigate only about 33% of the total commanded area. This means that their headworks continue to suffer from an unassured supply of water and must be streng-

thened by two or three additional dams on the main stream to impound sufficient water during the rainy season.

Relative importance of various sources of irrigation in each district of the region may be adjudged from the following table :

TABLE 3
Irrigation in Bundelkhand
(1959-60 to 1963-64)

	Irrigated area in hectares	% Canals	% Tanks	% wells
Jhansi	62,599	49.3	3.2	47.4
Jalaun	81,342	99.5	..	..
Hamirpur	52,258	91.6	..	7.6
Banda	80,491	98.0	1.0	0.8
Datia	4,053	10.0	..	90.0
Tikamgarh	44,208	11.7	17.1	71.1
Chhatarpur	43,630	3.6	7.3	88.1
Lahar-Bhan- der enclave	4,086	40.0	10.0	50.0
Region	372,567	50.5	4.8	44.4

Prospects for Food : Although the present level of food consumption is not fully known, estimates indicate that Bundelkhand is more or less self-sufficient in food production. The short fall is however, significant in respect of fruits and vegetables and edible oils. It may be remarked that despite apparently surplus condition in food-stuff, the people of Bundelkhand do not enjoy adequate nutrition. Cereals and other food crops are subject to distress sale.

Sub-Regional Contrasts in Farming : Various regions, though broadly similar in agricultural aspects, exhibit variations in cropping intensity and crop combinations. Cropping intensity is highest (130-140%) in Banda, Naraini and Tikamgarh tahsils which are well-served by irrigation. Region of medium intensity (110-120%) is found in Jhansi, Lalitpur, Mahroni, Chhatarpur and Bijawar tahsils. Most of the Bundelkhand plain (except in Banda and Naraini tahsils) is the region of lowest cropping intensity because of conservative agricultural practices. Crop-com-

binations based on Weaver's formula reveal that north-western region of dry as well as irrigation farming is essentially a region of gram, wheat and jowar with gram as the first ranking crop and wheat or jowar as second ranking crop. On the other hand, in the south-eastern region rice is either the first or the second ranking crop, especially in most of Banda and Naraini tahsils. In the same region, however, owing to rocky exposures and high relief of Ajaigarh range rice is replaced by gram or wheat as the major crop. Between the gram-wheat culture of the west and rice culture of the east, separated by 95 cm isohyet, there is an intermediate or transitional region of diversified agriculture. Depending on local conditions anything like gram, oil-seeds (til), wheat or *Pan* (Betel) might occupy the first place in terms of acreage, production or value. In the western part of this transitional zone, tank irrigation in much of Tikamgarh and canal irrigation in Lalitpur and Mahroni tahsils have helped to replace this combination by a more intensive wheat-jowar-rice culture.

Industrial Economy

Bundelkhand is industrially undeveloped. The region lacks not only in basic raw materials and infrastructure but also in entrepreneurship—the three pre-requisites for industrialization. These limitations have further deprived the region even of the industries ancillary to agriculture.

The region has no large-scale industrial establishments. Industrial structure comprises largely of house-hold and small scale industries amongst which saw-milling and wood works, charcoal making, textile (handloom) and leather goods (indigenous shoes), flour and oil milling are important not so much from the point of returns as in terms of their extreme dispersal and rural employment.

The handloom industry in Bundelkhand has got its traditional background and at present, about 4 lakh families depend on it. This industry has earned a good reputation for its *Chanderi* and *Maheshwari saris*, *Kosa* silk and other traditional fabrics. The *Chanderi saris* of Lalitpur may fetch foreign exchange by extending proper

protection to it. There are 19,046 weavers having 16,153 handlooms arranged on the co-operative basis in the Jhansi division.²⁵ Most of the raw materials are either purchased from Rani-pur and Mau Ranipur towns or brought from elsewhere. The industry has shown remarkable progress in recent years.

Apart from the above, the region also has got a few other industries, i.e., lacquerware articles, soft stone-work and brassware works of Chhatar-pur. Diamond cutting and polishing is a significant industry in Panna district. In addition to these, forests also have industrial prospects producing timber, lac, gum, honey, catechu, various edible fruits and roots also.

Transport and Communications

The difficult terrain, alongwith its cumulative effects on the economy, has hindered the development of the means of transport and communication in the region, especially in Panna, Ajaigarh and Bijawar where pack animals are the only important means of moving commodities.

The total length of roads is about 4,800 km shared equally by Uttar Pradesh and Madhya Pradesh parts of the region. Out of these, 60% are all-weather roads and the rest are fair-weather roads. The length of roads per km² of area in U. P. Bundelkhand is 0.21 and in M. P. Bundelkhand 0.27 km. These figures indicate that there is much scope for development of all-weather motorable roads in the whole region in order to break the geographical isolation of the region.

In the pre-British period, Bundelkhand had few all-weather roads. The two most important routes passing through Central Indian Agency were the Gwalior-Sagar and the Allahabad-Jabal-pur highways at the outskirts of the region, one at the western and the other at the eastern fringe with no feeder roads worth the name, linking them with the interior. This situation created serious difficulties, particularly during famine periods in moving food and fodder into the affected areas. Most of the roads in the interior were constructed as relief measures. Jhansi-Manikpur and Kanpur-Banda branch lines of the Central Railway were built as a part of relief work.

With the exception of Jhansi, no other district reaches the ideal road kilometrage as per star-grid formula meaning thereby that the districts are still very much short of minimum road accessibility. For instance, Banda has only 584 km road length (1966) as against the required length (736), Hamirpur 472 against 722 and Jalaun 344 against 432. Increased immobility during the rainy season causes rise in prices of consumable articles.

Bullock cart is still the most popular mode of conveyance. Motor truck has not yet replaced it in the country side, though on State and district roads, motor vehicles ply. State buses now ply over all-weather roads while private buses have been allowed on fair weather roads in the interior. Recently, inter-State bus services (e. g. Sagar-Kanpur) have also been started with great success.

M. P. Bundelkhand is poorly served by railways and well-served by roads. Road forms the backbone of transportation in this region. The region is oriented towards U. P. The road traffic is high and consists chiefly of forest produce, cloth and general merchandise. Chhatarpur-Panna shows a sub-regional character depending totally on roads. On the other hand, in the north-western Bundelkhand the traffic is more related to U. P. and thus inter-State transportation is important.

The Regions

By and large, Bundelkhand is a distinct geographical region of India. It has its basis not only in the structural unity, geomorphic homogeneity and climatic uniformity, but also in the common history, economy and society of the people. However, this overall homogeneity, when subjected to more thorough scrutiny permits further sub-divisions into several units on the basis of their physical, social and economic distinctiveness. In no case does the variety of sub-units impair the fundamental unity of the region.

In the scheme that follows, Bundelkhand has been divided into two regions of first order, six regions of second order and 14 third order regions (Fig. 15.9). The fundamental principle on which the regions of the first order are determined is that of general relief, while the regions of the second order, considered on the basis of

principle of interfluves and relief. In the regions of third order, factors of local significance, such as characteristics of soil and vegetation, cropping-intensity, and socio-cultural aspects have been associated.

Regional Scheme

29. Bundelkhand Plain

(a) Ravine Belt :

- (i) Yamuna Ravine Tract-West
- (ii) Yamuna Ravine Tract-East
- (iii) Betwa Ravine Tract

(b) Jalaun Plain :

- (i) Sind-Pahuj Tract
- (ii) Pahuj-Betwa Tract

(c) Hamirpur Plain :

- (i) Turi Basin
- (ii) Rath Tract
- (iii) Maudaha-Maundi Tract

(d) Banda Plain :

- (i) Banda Plain-West
- (ii) Banda Plain-East

30. Bundelkhand Upland

(e) Bundelkhand Gneissic Region

- (i) Bundelkhand Gneissic Peneplain
- (ii) Bundelkhand Gneissic Plateau

(f) Bundelkhand-Vindhyan Plateau

- (i) Vindhyan Hill Ranges
- (ii) Banda (Chitrakut) Plateau

Bundelkhand Plain

The Bundelkhand Plain, often termed as Trans-Yamuna plain, is low-lying elongated tract, the Yamuna marking its northern base. The region, suffers from imperfect drainage in the central part which is often inundated during the rainy season.

The region is divided into four units of second order and 10 of the third order. The northernmost region is that of the Ravine Belt, about 2 to 3 km broad, developed along the main streams, especially along their lower reaches near their confluences with the Yamuna. This is a narrow belt of bad-land topography, dissected by innumerable gullies cutting into soft and erosive deposits. The ravines are notable for poor means of transportation and serve as ideal hide-outs

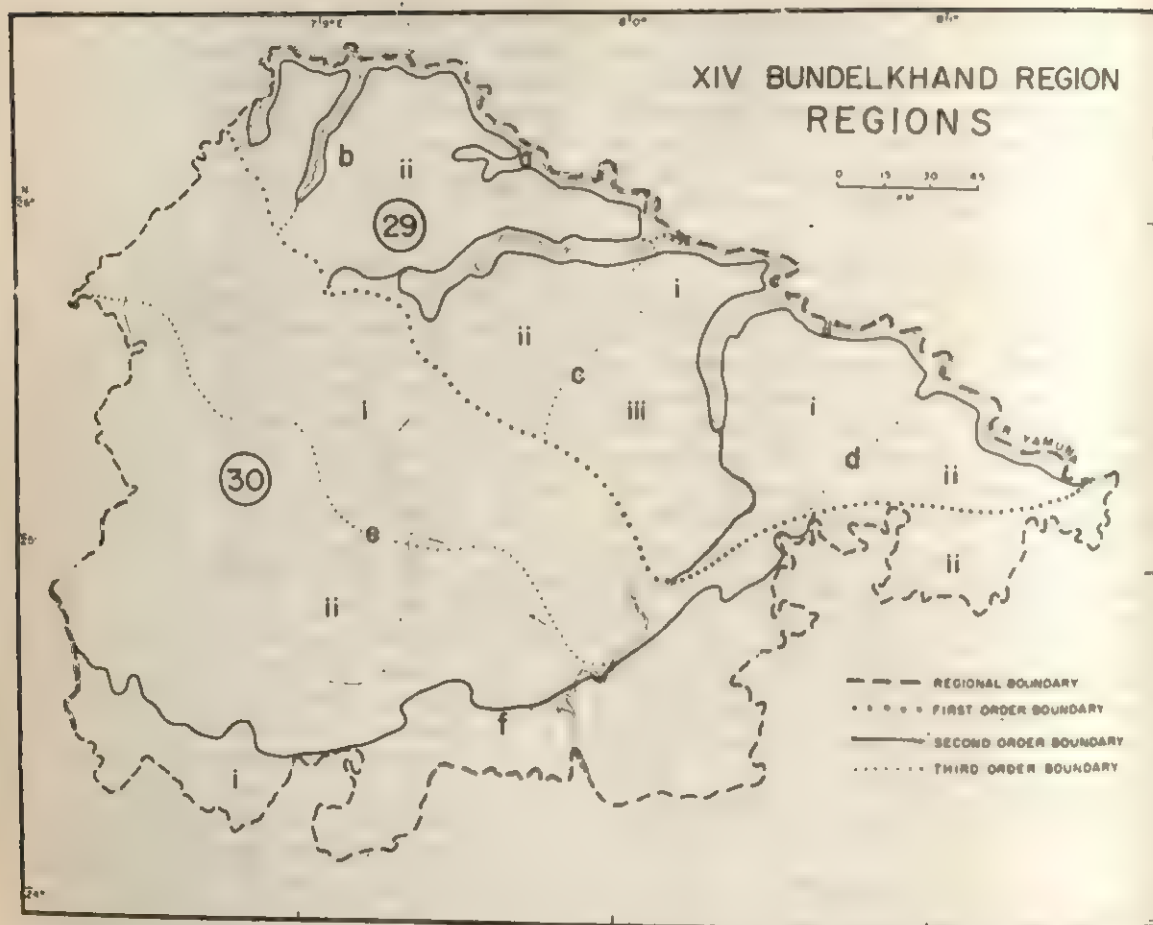


Fig. 15.9

for dacoits who strike terror and endanger social security. As a consequence, the ravine zone is dotted with a large number of deserted villages and fields. Thus, the physical disability has caused social instability and insecurity. These ravines are more fully developed along the Chambal, the Kunwari, the Sind and the Pahuj in the north-western part of the region. They are also found along the Betwa and the Ken. Based on their intensity we may designate them as the Yamuna Ravine Tract West, the Yamuna Ravine Tract East and the Betwa Ravines Tract. The Yamuna Ravine Tract West extends southward to incorporate the ravines of Sind and Pahuj, and the Yamuna Ravine Tract East includes the ravines of the Ken. The ravines of the Betwa

have been singled out for their distinctive character (Fig. 15.10).

As regards the land-use pattern in the ravines, it is exemplified from the village Uncho situated to the east of the Pahuj (Jalaun district). The cropping pattern of the village includes chiefly the cereals, pulses and a few vegetables. The village enjoys the facility of canal irrigation from the Kuthond branch of the Betwa canal system (Fig. 15.11).

The *Jalaun plain* covers the western tract between the Sind and the Betwa. It is relatively a dry region with an average annual rainfall of 80 cm. Its soils (*Aabar*, *Mar* and *Parna*) are fertile and respond well to irrigation. It is predominantly a gram-wheat-bajra region. The

SETTLEMENT PATTERNS

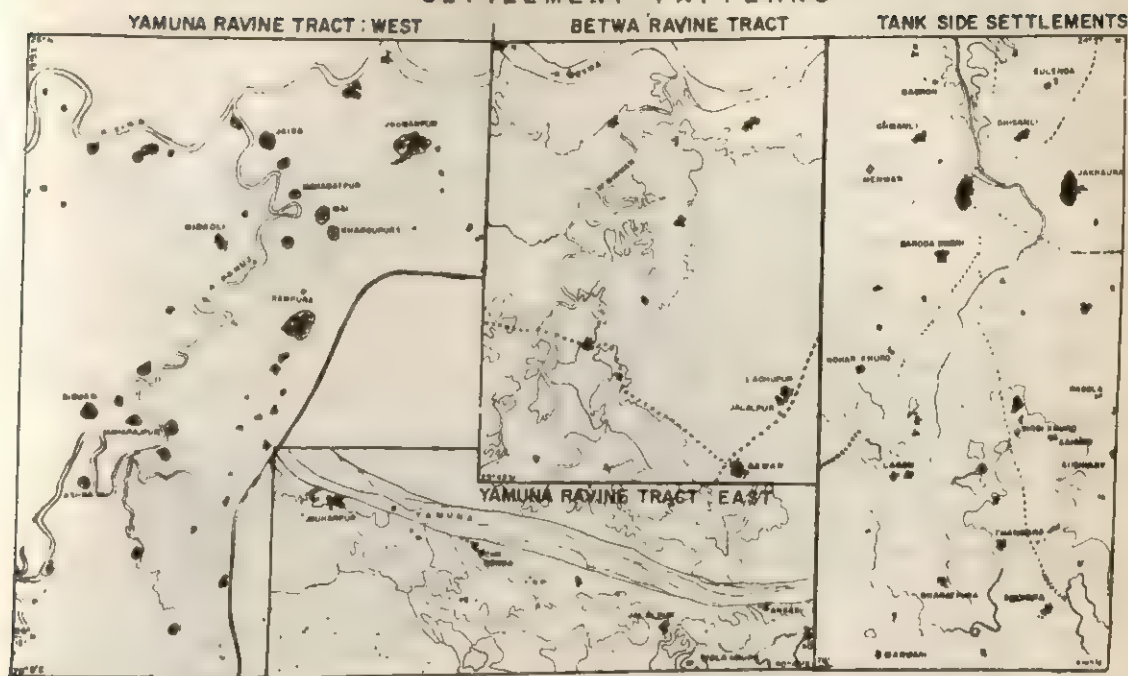


Fig. 15.10

western part of this region i.e. Sindh-Pahuj Tract is not only sandy but is also drier with meagre facility for irrigation. As a result, it is a dry-farming tract. In the Jalaun plain proper, namely the Pahuj-Betwa Tract, development of Kuthond and Hamirpur branches of Betwa canal has brought about considerable improvement in agriculture leading to dense population and fairly even distribution of settlement. Kanpur-Jhansi branch of the Central Railway has also ushered in economic development.

The Hamirpur plain is neither as dry as the Jalaun plain nor as wet as the Banda plain; it is intermediate in situation as in climate. It is also one where black soils, which do not require much irrigation, are dominant. This region may be divided into three sub-units. The Turi Basin is the northernmost area. It is an oblong depression subject to the annual inundation of the Ken caused by the impounding waters of the Yamuna when in spate. In fact, it represents an abandoned course of river Ken itself, now occu-

pled by Turi stream. Annual silting of this entire area makes it highly fertile for rabi crops.

Rest of the Hamirpur plain may be divided into Rath Tract (western) and Maudaha-Laundi Tract (eastern). In a large measure both are similar. Soils are similar in both the regions as also the crop association of gram, wheat and jowar. However, the surface relief and historico-cultural factors tend to cause differentiation. The surface relief of the eastern tract is hummocky being dotted with large number of hills crowned by forts and fortresses. It has indeed been traditional territory of the Bundelas with Mahoba as its regional capital. It is from this core area that the Bundelas extended their territory. The presence of a large number of tanks facilitates cash-cropping, i.e., betel-culture, especially around Mahoba. The Rath Tract, on the other hand, is more or less a plain country with grain farming as the dominant economic activity depending mainly on canal irrigation (Dhasan canal system). Besides, the Laundi tahsil of Chhatarpur district is well known

the Bundelkhand Gneissic Region and the Bundelkhand-Vindhyan Plateau, being further divisible into two regions of third order each.

The *Bundelkhand Gneissic Region*, comprising much of Datia, Jhansi, Tikamgarh and Chhatarpur districts, represents the geological nucleus of the Region and stands as an ancient massif of subdued relief. It appears to have been peneplanated at least twice in its geological history and has been encroached upon by recent alluvium in the north. In the west, southwest and southeast it is overlain by Vindhyan and Bijawar sediments. With its intermediate locations between the Plain in the north and the Gneissic Plateau in the south, the Bundelkhand Gneissic Peneplain partakes the characteristics of both. One may notice here and there crumbling dykes and isolated groups of granite and gneissic boulders half-buried under the alluvium. Most of the area covered by light black soils is devoted to grain farming, especially jowar, wheat and gram. In the eastern part, namely in Chhatarpur tahsil, the agricultural landscape changes and a high degree of crop diversification is introduced owing to diversified relief and availability or otherwise of irrigation by tanks. This is not the case with western parts as the Betwa canal has given the farmers an opportunity to concentrate on wheat and rice as also on jowar which is mostly dependent on rain.

The village Bijoli located to the south of Jhansi city along the Jhansi-Itarsi railway, presents land-use pattern characterised by the cropping of wheat, barley, rice, maize, small millets, gram, urd, mung, vegetables, etc. It is also marked by cultivable waste and fallow lands.

The *Bundelkhand Gneissic Plateau* is an area where massive granites and gneisses have been exposed at the surface with small patches of black soils formed *in situ*. These soils are generally deep in the depressions. Excessive soil moisture during the wet season causes the growth of pernicious weed, the *Kans*. The landscape of this area is generally characterised by large chunks of rocky wastelands and undulating surface with a number of shallow waterbodies. Tikamgarh tahsil is an exception in this agriculturally poor region because it has a good supply of water from

a large number of tanks which makes it an area of high cropping intensity (120%) with rice as the first ranking crop. In the eastern part of the region wheat and oil seeds (*til*) become more important than rice or wheat or jowar. As a whole the region presents a picture of social and economic diversity, depending on various local factors. Villages are generally perched on rocky prominences around a small fort which stands nearby a tank or lake—natural or artificial, viz., village Delwara and Jakhaura in Lalitpur tahsil. The latter has developed as a service centre where recently the Block Development Office has been added to its cultural landscape. The area of the village comprises 1,907.3 hectares with a population of 3,499 persons (1961) of which one-fifth is scheduled caste.

The Bundelkhand-Vindhyan Plateau is physiographically different from other regions. It is divided into two sub-regions : (i) The region of *Vindhyan Hill Ranges* forms the southern and south-eastern margin of the Bundelkhand region. It is a narrow belt of flat-topped hill ranges known as Panna, Ajaigarh and Vindhychal in different parts. The region terminates in steep scarps, both towards north and south.—Although much of the area is overgrown with inferior jungles, yet there are also patches of reserved forests, specially in Lalitpur, Mehroni and Ajaigarh tahsils. *Tendu* tree is quite common throughout the Panna and Ajaigarh forests and its leaves are used for *bidi* making. As a whole, the region lacks in agricultural resources and economy of the people is partially supplemented by the forest produce.

(ii) The *Banda or Chitrakut Plateau*, lying south of the Banda Plain is a continuation of the Vindhyan hill ranges. This plateau is locally called as *Pattha* and includes within it the tableland north and south of the Vindhychal range. The ascent from the plain to the plateau is very sharp through an imposing scarp termed as *ari*. The plateau rises from the plain in two or three escarpments, one over the other, separated by narrow summit plains. The Banda plateau is a highly dissected upland incised by deep valleys of seasonal torrents. It is, therefore, largely inaccessible and is covered by forests mostly reserved. The region as a

whole is sparsely populated. It is of great significance to every righteous Hindu owing to the presence of the holy temples at Chitrakut-dham—a place of striking beauty and scenic attraction. However, wide expanses of *patha* soils, developed on sandstones *in situ*, permit poor agriculture with inferior millets (*Kodon* and *Kutki*) grown after long intervals of fallowing. Of considerable economic significance are the sandstones and glass sands which are quarried in sizeable quantities.

Regional Synthesis

It may be emphasised once again that many-fold sub-division of Bundelkhand as out-lined above, in order to highlight the sub-regional variations, is not intended to give an exaggerated picture of regional diversity and to impair the long-preserved overall unity. In fact, there exists a real social, economic and emotional oneness in the whole of the Bundelkhand. Agriculture, the common vehicle of social and economic life of the people, is the real backbone of regional economy. Quarrying, lumbering, etc., are the only activities of some economic significance in much of the plateau region.

The backwardness of the region may be partly attributed to its political bifurcation into two different political units (northern Plain in U. P. and the southern plateau in M. P.) since the medieval times. This has brought about an economic imbalance in the region. This was not the state of affairs when the Bundelas in 14th and 15th centuries maintained their hegemony over the whole tract lying between the Yamuna in the north and the Vindhyan plateau in the south. The northern plain of Bundelkhand provided the food and the plateau region supplied minerals (diamond, building stones and iron ore) as well as timber from the forests. No wonder, therefore, that Bundelkhand remained for long a bulwark for the Moghuls, who later on succeeded in capturing the plain area, comprising much of Jalaun, Hamirpur and Banda districts. This is a major historical event which wrecked the Bundelas not only economically but also politically. The British almost maintained the *status quo* and merged Jalaun, Jhansi, Hamirpur and Banda districts in the then North-West Provinces. They allowed the feudal

chiefs to continue to govern their petty states which satisfied their ego. Even after Independence the region has remained mostly neglected.

Problems and Prospects

The main problem of Bundelkhand is connected with the improvement of agriculture which suffers from vagaries of rain, pests, diseases and incidence of large scale erosion of soils. Moreover, the extensive waste lands in the form of ravine tracts, rocky wastes and scrub lands with extremes of temperature are other limiting factors.

Apart from the above, the index of gross value of agricultural production per acre of net sown area in Bundelkhand happens to be 77, as compared to 105 in eastern U. P. and 100 in U. P. as a whole. Moreover, the net irrigated area records about 15% of the net sown area in the region while the double cropped area is only about 10 percent. Of the total cropped area food crops account for 94.5%, and the fruits and vegetables form 0.3% only. In order to overhaul the above picture, the efforts made so far for the improvement of agriculture through various land reform measures,²⁰ the U. P. Soil Conservation and Ravine Development Scheme, the U. P. Consolidation of Holdings Act as well as the U. P. Zamindari Abolition and Land Reform Act have not yet been able to induce any considerable changes in the regional economy. The provision of extending minor irrigation facilities, on the other hand, has been helpful in cultivation during adverse conditions.

With a view to checking the weeds, the U. P. government instituted a *Kans Eradication Scheme* which involved generally the construction of high fences around the fields and repeated deep ploughing of the soils. The problem of desiccation in the western Bundelkhand marked by small coverage of natural vegetation (Jhansi 9.4%, Datia 10.9, and Bhind 0.4) presents great difficulties in the success of the schemes. The ravines are expanding at a phenomenal rate of about 82 hectares in U. P. Bundelkhand and about 125 hectares in M. P. Bundelkhand per year over the neighbouring fertile tract. Although the reclamation of ravines of more than 5 m depth is prohibitive in terms of cost involved, it is necessary to under-

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In the long run, it is quite surprising to note that Bundelkhand remains to be a surplus region (except during prolonged periods of droughts) only because of distress sale and lower pressure of population on land. This is why a better record of per capita income (Rs. 357/-) in Bundelkhand is observed as compared to the problem district of Azamgarh (Rs. 199/-) in eastern U. P.²⁸ Of course, by the end of A. D. 2000 when the present population would be doubled more resources would be essential to meet the situation. On the whole, for administrative and development purposes M. P. and U. P. Governments would have to form a Joint Board.

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The Region (21° 29' - 25° 11' N and 78° 15' - 84° 15' E) covers an area of about 140,172 km² with a population of 9.86 million (1961). Located as it is in the Central part of the Peninsular 'foreland' and between the alluvial stretch of the Great

Plains and the Deccan, it naturally presents a transitional zone incorporating the Vindhyan-chal and Satpuranchal. The very name of the region is derived from the combination of physical and cultural complex, the Vindhyan-chal-



Fig. 16.1

Satpuranchal being superimposed by the Baghel Rajput-dominant tribal culture complex. As an amalgam of ridges and valleys, bare rock expanses and sheltered alluvial basins, thick forest covers and agricultural lands, and former British territories and feudatory States, the region has ever since provided for the consolidation of princely powers in isolation, being driven from adjoining regions, and also rather as a sort of solace and escape in space. This land of tribal dominance, neglected till late and regarded as a 'liability' (economically) by the rulers of the plains has now caught the attention of the government. The installation of a major hydel power plant at Pipri has given sufficient impetus towards the development of a 'growth pole' for an emerging region, which, when provided with adequate transport facilities, where some vital links are already under construction, will definitely become the focus of a distinct region. This hitherto inaccessible region represents a political and cultural agglomeration too, under the influence of varied human responses from all sides in this rather simple physiographic terrain. Even at present it incorporates within its bounds the parts of the States of Madhya Pradesh (Chhindwara, Seoni, Balaghat, Narsinghpur, Jabalpur, Damoh, Panna (Pawai Tahsil), Satna, Rewa, Sidhi, Shahdol and Surguja), Uttar Pradesh (Mirzapur) and Bihar (Southern part of Sasaram and Bhabhua sub-divisions). vide Fig. 16.1.

Historical Background

The hilly and forested country of Vindhyanchal-Baghelkhand has been till recently regarded generally as a wilderness and an untamed country inhabited by a number of tribal groups of widely varying primitive cultures with overtones of ruling princelings drawing strength from the valleys settled by civilised and agricultural people. Though history is not very eloquent about this region, there are several inscriptions, records, anecdotes and travel accounts etc. which show that prior to the Rajput occupation of the middle part of India, about the 12th Century A. D., the tribals were the owners of land and property and were the rulers in most parts of the region,¹ while

the outlying areas in touch with the Great Plains or parts of other larger valleys such as that of Mirzapur or Rohtasgarh plateaux etc. were also controlled and ruled earlier by some of the important tribal dynasties.² The region has been the 'den of refuge' for succession of peoples who were vanquished in the plains and refusing to be absorbed by the victors, retired to the safety of this isolated hilly tract. Such proud peoples as the Cherus, Kharwars etc. of the Rohtas and Mirzapur plateaux are cases in point.

The region embodies a wide sweep of the social, cultural and economic configuration of the Indian history : here are some of the most primitive tribes barely and only recently out from the pure hunting and collecting stage, and also the very advanced groups with rich traditional history and ancient genealogy, and sophisticated Hindu culture.

The lineaments of hill-basin-tableland complexes have governed the approaches of peoples here. The Vindhyan barrier generally restrained the Aryan advance to the south from the Great Plains, but it did not effect the same from the west through the Narmada valley, and yet south and east of the Nagpur plain the country becomes again hilly and inhospitable to check easy advances.³

Yet, these areas have been governed by very ancient ruling peoples who managed to filter through the various gaps, though never in large bodies, until the last three hundred years, when main influx of Hindi-speaking people from the north occurred. The Hindu missionaries, however, exerted their influence and spread the seeds of advanced culture and traits. The Bharsaiva, Uchkalya and Panorijah families were ruling in different areas of Baghelkhand and were counted under the 'Eighteen Forest Kingdoms of Central India' under the paramountcy of the Imperial Guptas.⁴ Dahala kingdom is famous in the inscription of Allahabad pillar of Samudragupta, erected in A. D. 350. By A. D. 249 the kings of the famous Haihaiyanshi line of Chhattisgarh who established themselves at Maheshwar (modern Indore) and later at Kalinjar, reigned in the eastern territory with their capital at Kalinjar and were

long known as Kalinjaradhishwara or 'lord of Kalinjar'.⁵ They were also known as Chedis or Cheidyas as an important Central Indian tribe and rulers of the *Chedidesa* (land of the Chedis). They were removed from Kalinjar by the Chandel chief, Yasovarma (925-55), and finally by the Muslim onslaught but remained in control of vast possessions until the 20th century. Later, Baghelkhand region passed to Sri Byaghra Deo who migrated from Gujarat (A. D. 1233). His son established the capital at Bandogarh fort, which he received in dowry from the Haihaya kings of Ratanpur (Chhattisgarh). The Baghel Rajputs gave to this vast territory the name of Baghelkhand.⁶

Outside Baghelkhand in the Vindhyanal region, the Dravidian-speaking *Gonds*, around the fourteenth and fifteenth centuries, developed kingdoms of large extent and gave the name *Gondwana*. According to Russel and Hira Lal,⁷ there rose more or less simultaneously four Gond kingdoms with their capitals at Garha, Deogarh, Kherla and Chanda. The Mahakoshal region was their stronghold. They ruled till 16th century, when they were vanquished by the Moghuls though their suzerainty was only nominal. The Gond kings adopted the Hindu customs and strived for Rajputizing themselves⁸ through Sanskritization, marriages among the Rajput families, etc.⁹ Their rulership was through the process of subinfeudation, though there was some bureaucratized machinery cutting across.¹⁰

Between 17th and second half of the 18th century, however, the region was swept over repeatedly by the Marathas. This period was marked by wide settlement and colonization in the hitherto 'jungly areas'. Many non-tribal Hindu castes, famous for their agricultural pursuits, like the Marars and Kurmis were brought and settled.¹¹ As is the general process, the tribals were either pushed out or they themselves withdrew to the comparative safety of the hills and jungles, where they could maintain their cultural identity and way of life unruffled, though it was hard upon them as the resources of sustenance became scarcer with increasing elevation and inaccessibility; some of the tribes, however, learnt the technique of cul-

tivation and other traits of Hindu culture. The tribal habitats are the most inaccessible and unpromising areas of the region with unhealthy tracts of very uneven and rugged terrain, thin and stony soils and widespread jungles.

The entire region as the tangle of hill and plateau complex of Central India, being safer than the plains, has been also the promise land for the shelter of a number of local rulers, and patriots who could defy the foreign domination and maintain an air of independence for a major part of the historical past. The area is dotted with numerous *gerhs* and *garhis* (hill forts) which could be built easily here. Rohtasgarh, Bijaigarh and Saktesgarh forts have seen many a battle controlling as they did large areas under their massive ramparts and benign shadow.

As such, since the region came under the British power, it remained both under them directly and also as a congeries of petty States of varying dimensions, the British remaining as the paramount power. Baraundha, Nagod, Maihar, Sohawal, Kothi, Jago, Paldeo, Pahra, Taraon, Bhaisaunda and Kenta Maiana were eleven other states with Rewa as the largest State (33,670 km²) in Baghelkhand. These States formed part of the Central India agency; after Independence they were mostly consolidated into Vindhya Pradesh and finally into Madhya Pradesh after 1956.

The Physical Setting

The age-old operation of the morphogenetic processes (since Archaean) in consonance with the lithology (less resistant phyllite and mica schists to resistant quartzites), punctuated by the tectonics of varied nature and intensity (resulting in buckling, tearing, transgressions, intrusions, effusions etc.) have carved out varieties of landforms (morphological facets) of different orders. The altitude ranging from 150 m to over 1,200 m shows more uneven areal expanses of the sub-height groups which have their spatial significance too (Fig. 16.2). Main elements of physiography in this hill-valley complex are the scarps of the Vindhyan sandstones overlooking the two hollows i.e. the Ganga Plain in the north and the Narmada-Son trough on the south. The tributa-

PLATE XIII



Road bridge on the Son, at Chopan



Landscape in Ghaggar Depression in the Son Valley



Settlements and Land use patterns in the Foot-hills of Sinihachalam



Khandgiri Temple, Orissa

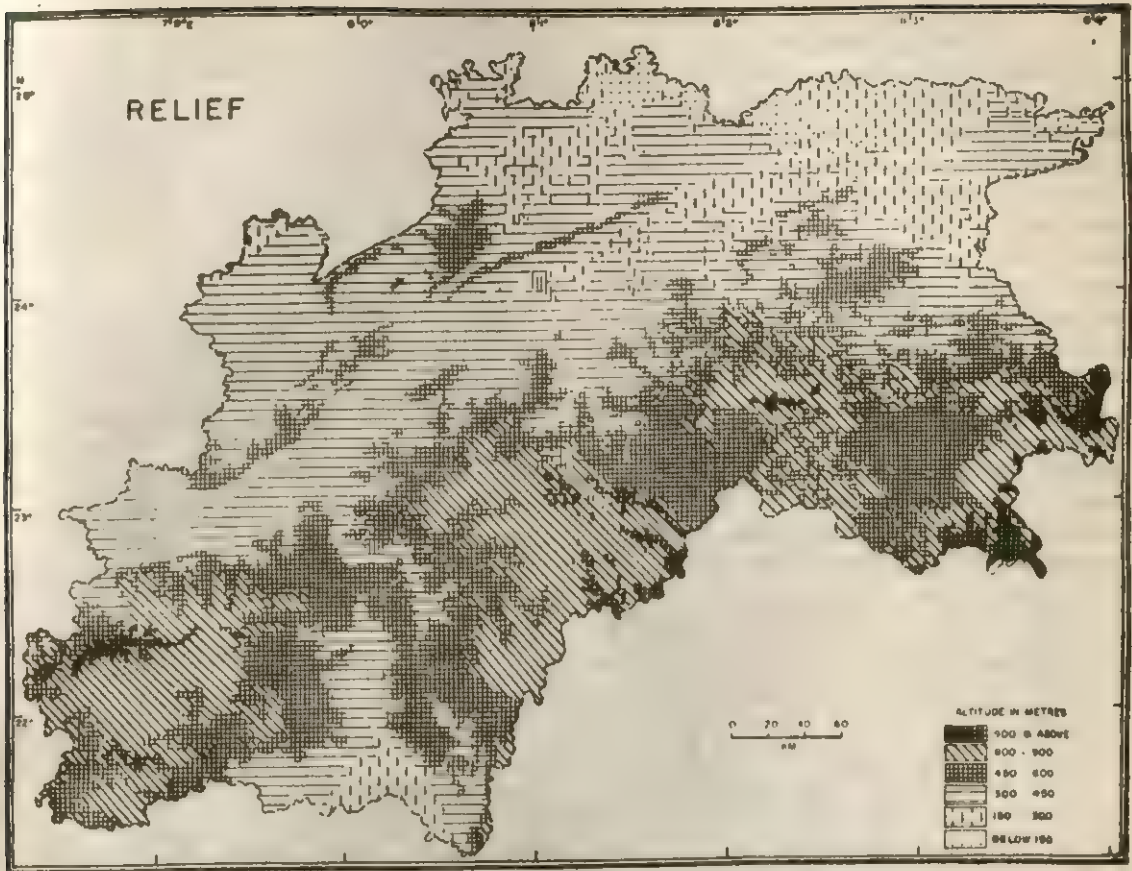


Fig. 16.2

ries of the Ganga have notched out the northern scarps to make them very irregular and indentations extend several km together, but the southern scarps are wall-like steep, and regular, rising sometimes 300 m or more above the valley floor, and are seldom cut through by any stream of significance.

The Grest, seldom exceeding 800 m, of the ranges, Bhanrer and Kaimurs as they are known, lies much closer to the trough-axis, sometimes less than 6 km, or else, even some of the north-flowing tributaries (such as the Karmanasa) of the Ganga take their rise within this zone. The exceptions to it are accidental, like the one being the capture of the Turra by the Ghaggar and thereby diverting the waters of the Bijaigarh uplands to the Son, formerly flowing into the Ganga pro-

bably through the Belan.

Between the two scarps are arranged in steps the plateaus of Satna, Rewa and Mirzapur in descending altitudes but the western and eastern fringes are formed by the relatively lower Sonar Uplands and higher Rohtas Plateau respectively. The total Upper Vindhyan landscape in accordance with its geolithology is simple. The general horizontality of strata shows no signs of marked disturbance except minor crumplings in the western section and overall tilting to the north. The falls and gorges (at places 50 m deep and several km long as that of the Karmanasa and the Pandwa) common to the streams descending the plateaus throughout and marking the entrenchings introduced by the Tertiary uplift, clearly exhibit the horizontal sandstone beds. The ridges pro-

bably owe to the massive quartzite cappings and mark a large scale hogback structure.

The Narmada-Son trough, a structural dislocation along the junction of the Archaeans and the Bijawars with the Vindhya, marking the boundary fault and occupied by the strike valleys of the west-flowing Narmada and the east-flowing Son, has the lower Vindhya (porcellanites, shales etc.) as its basement probably due to the removal of the overlying rocks. The position of this gorge running EW across the area becomes more pronounced within the confines of the two limbs of different formations and magnitudes, at places only 5 km. apart but seldom exceeding 16 km. The confused watershed lying in the Jabalpur (Haveli basin), the detached hillocks and spurs of different heights, the much broken southern wall etc., do speak of the revitalisation of

river regimes in stages. The most striking contrast between the two giants of the trough, the Narmada and the Son, is the almost graded profile (gradient 0.3 m/km)¹² of the latter which reflects even braidings at places and the youthful appearance of the valley of the former (gradient about 5 m/km) which has falls, rapids and gorges in its course. The Dhuandhar falls (Bheraghat, 15 m) followed by a 3 km long marble gorge¹³ is an example in point.

South of this structural-cum-erosional trough, the "furrow" of Spate,¹⁴ lies the geological and physiographic complex (eastern extension of the Satpura), where the Archaean metamorphics, the mixed sedimentaries with igneous intrusions (Bijawars), the Gondwanas and over and above the Traps appear with their distinct topographic expressions (Fig. 16.3). It is here that the coun-

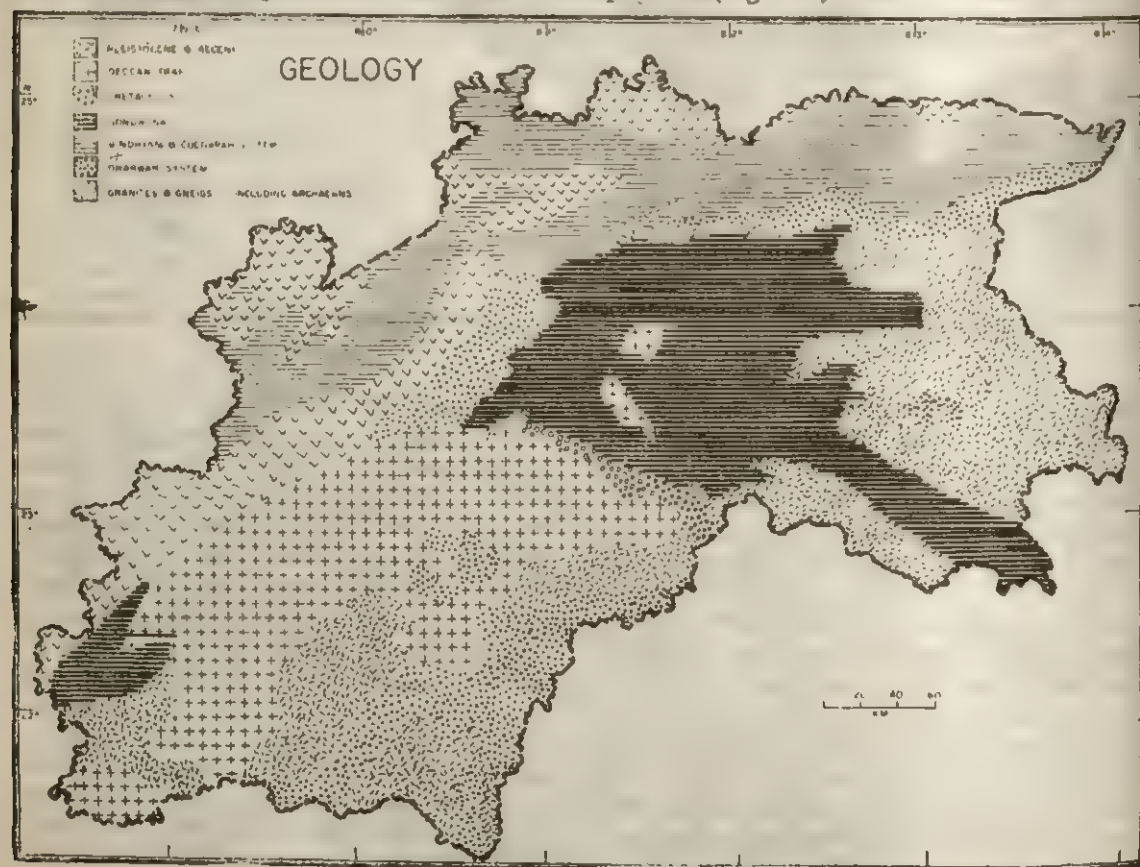


Fig. 16.3

try's core of the radial drainage, the Amarkantak (1,087 m), is located in the Maikals overlooking the great Chhattisgarh basin and marking the shore-lines of the Cuddapah sea. The whole surface is an assemblage of flat-topped plateaus (Chhindwara, Seoni, Maikal, Deogarh, etc.) with 600-900 m general elevation, flat basins (Singrauli, Dudhi, Ugli, Sohagpur, Surguja, etc.), laterite-capped plateaus i.e. the Pats (Jashpur, Jamira, Gulgul, Main, etc., all above 1,000m in elevation) and other minor topographic forms, the knolls, hills, ridges, spurs, gorges, etc. Almost all the plateaus, except Deogarh, have developed over Deccan Traps (Basalt); wherever erosion has succeeded in exposing the exhumed surfaces, the Dharwars, Gondwanas or sometimes even Archaeans are exposed. The exceptional heights of the plateau rims worth noting are those of the eastern rim of Maikal (1,100 m), and northern rim of Chhindwara (Mahadeo hills, 1,200 m). Among the basins, Singrauli and Dudhi (150-300 m) are Upper Gondwana basins while that of Ugli has an elevation of 300-450 m and those of Sohagpur and Surguja have an elevation of 450-600 m, all being Lower Gondwana basins. Though all the formations excel in the minor topographic expressions, the knolls are more favoured to the Archaean exposure, as observed in the Pangan valley (a tributary of the Kanhar). All the streams joining the Son on to its right have defined alternating basin-and-gorge topography, the latter being near the confluences.

Irrespective of the absolute heights the relative relief is accentuated due to the location of the scarps and the gorges as it rises to more than 250 m along the trough and on the rims of the basins whereas the plateaus throughout exhibit less than 50 m. The general slope also corresponds with the relative relief. Major events responsible for the present topography may be mentioned as the planation by Permo-carb. glaciation and the impulses of the recent uplifts in the Himalaya. Several erosion surfaces such as between a 300-400 m, 450-550 m and above 600 m, etc. can clearly be marked in the area.

Although the Narmada and the Son are the two main streams of the region, almost entire block

lying north of the trough is drained into the Ganga through its subsequents or rather accidental subsequents, the Durgawati, the Karmansa, Jirgo, Harrai, Khajuri, Ojhla, Karnauti, Tons, Ken and their tributaries, all exhibiting the dendritic patterns, and descending with falls and rapids followed by deep gorges, a feature imparted by the Himalayan orogenesis, and often having their headwaters in the ranges overlooking the trough. The streams between the Karmanasa and the Tons appear to have lost their headwaters to the Belan, a westerly flowing tributary of the Tons and occupying a minor syncline. Thus the catchments of the Narmada and the Son northward are restricted by the Bhanrer and Kaimur ranges. Contrary to it, the Son has a much expansive catchment on to its south extending up to the catchment of the Mahanadi (Fig. 16.4). The tributaries, i.e., the Pandu, the Kanhar, the Rihand, the Bijul, the Gopad, the Banas and the Mahanadi all flow almost parallel from south to north and traverse the Archaeans, Dharwarians (Bijawars), Gondwanas and even the Traps. Extensive basins such as those of Sohagpur, Surguja, Singrauli etc., have been carved out in the relatively soft rock formations while they are forced to escape through narrow gorges where harder bed-rocks are encountered. This, however, has facilitated the taming of the streams as in case of the Rihand in Singrauli basin. These river basins with their rich alluvial covers have ever since served as the cultural oases in the vast rugged stony and forest-clad terrain of the region. The catchment of the Narmada is confined southward as well, except the main channel penetrating far deep into the Traps of the Maikal. The only significant right hand tributary of the Narmada is the Hiran which throughout its course follows the Bhanrer range at its foot and has an ill-defined watershed with the tributary of the Son in the Murwara basin.

On the southern slopes of the region are the tributaries or sub-tributaries of the Mahanadi and the Godavari, notable among them being the Wainganga and Hasdo which derive their source-waters from the Maikals and Korea hills respectively. The Ugli basin of Balaghat formed by the Wainganga is worth mentioning.

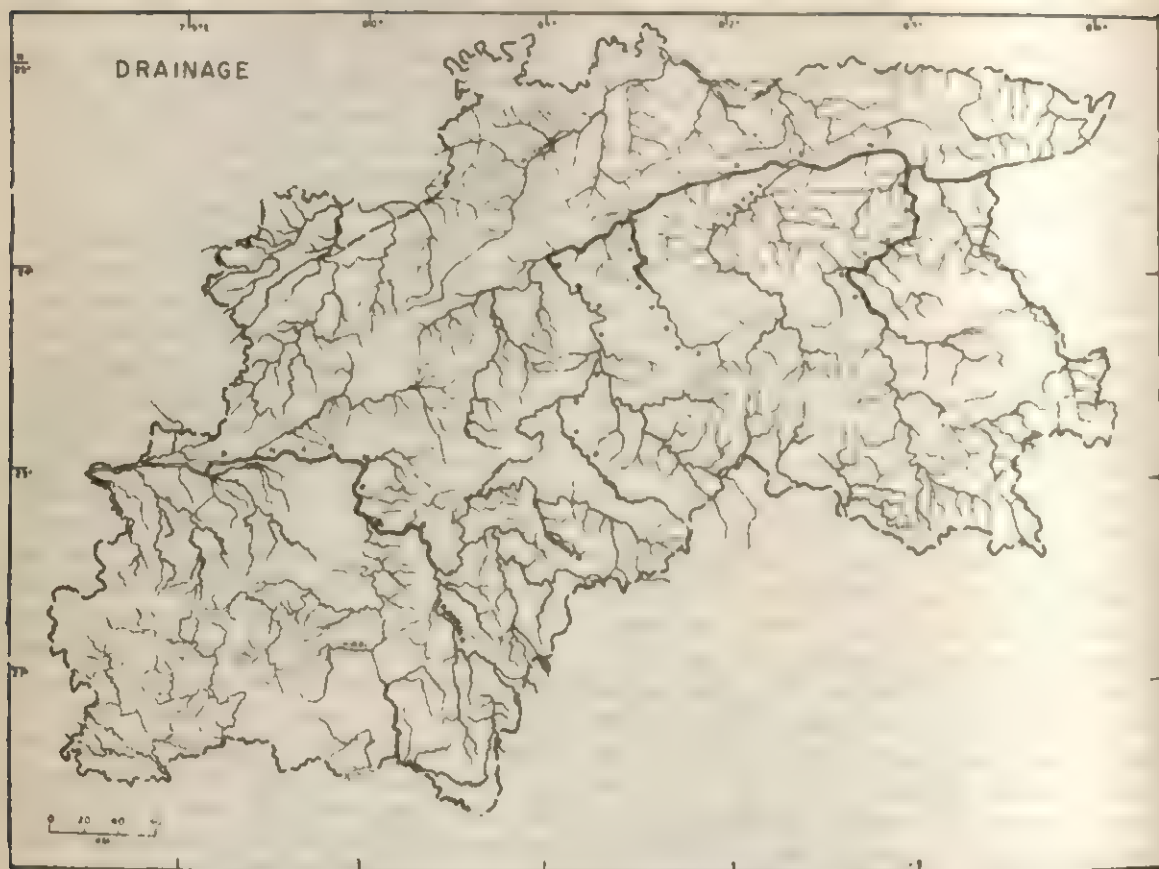


Fig. 16.4

Overall drainage distribution is quite uneven as the Vindhyan and Trappean plateaus along with the basins show coarse to medium texture (density less than 4 km per km²) while the Bijawars, Archaeans etc. along with the slopes show fine textures (over 4 km per km²).¹⁵ The general dendritic plan of distribution is locally disturbed by the rectangular patterns on the Bijawars in Mirzapur and Sidhi, the trellised pattern on the steep slopes such as of Agori uplands, and more localised radial, annular patterns. Over such a land, exposed to denudation since early times, the youthful features of topography, the behaviour of streams and also their distribution seek their explanation in the successive tectonic activities, within or outside the area, which have affected it in varying degrees. The recentmost event, i.e., the Himalayan orogeny, is more responsible for it,

otherwise this area, planated several times, would show a more senile topography than what it does now.

Climate

With its general monsoonal character, the region, according to Thornthwaite's first classification,¹⁶ falls in the Tropical Thermal Belt showing Thermal Efficiency Index of about 150 (Pipri)¹⁷ whereas the Precipitation Effectiveness Index (49 at Pipri) assigns it the grassland-type character. The average distribution of climatic elements with respect to time indicates the prevalence of four main seasons of unequal duration; dry summer (pre-monsoon season) March-May; wet summer (the monsoon season) June-Sept.; transitional period (post-monsoon season) Oct.-Nov. and winter season (Dec.-Feb.), which are marked by

distinct characteristics of the weather elements.

January marks the coldest month for the region when average monthly temperature lies well between 15°C and 18°C throughout except at Pipri (19.4°C) where it might owe to the proximity of the Pant Sagar. The condition is almost similar in December but February exhibits a rise of $3-4^{\circ}\text{C}$ (temperature ranging from 18.6°C at Ambikapur to 20.6°C at Seoni) over Jan. though the winter still prevails. During Dec. and Jan. the minimum temperature remains well below 5°C and occasionally with the sweep of the western disturbances and accompanying cold waves, it touches 0°C mark. Relative humidity, especially in the mornings, remains high (about 60%) and occasional showers (about 4 cm at Pipri to

8.3 cm at Shahdol), contributing about 5% to the annual precipitation, are also experienced.

The gradual increase in temperature and fall in the relative humidity become more pronounced by March as the former takes a leap of 5°C or over, while the latter declines by 15-20% and thus marks the on-set of the dry summer season. The temperature continues to rise till the third week of June when it records the maximum above 40°C , although May records the highest average ($31.6-33.7^{\circ}\text{C}$) and is regarded as the hottest month. In June owing to the outburst of the monsoon the sudden fall of over 10°C within the later half brings the average figures down. Due to lower humidity and vast expanses of bare rocks, the conditions are aggravated so much so that the

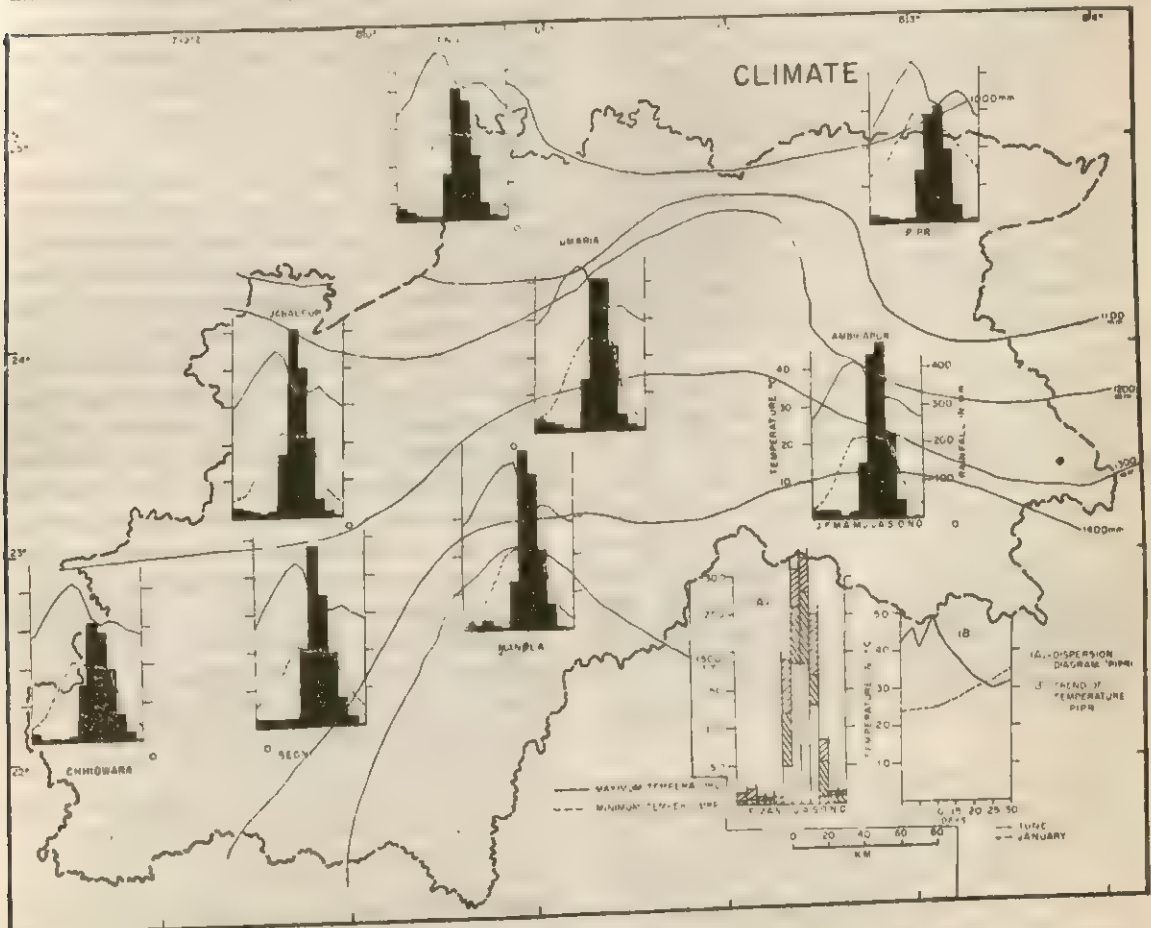


Fig. 16.5

temperature occasionally touches 50°C. Intense heating results in the local and short lived loo and heatwaves. In meagre pre-monsoon showers (contributing only about 2.5% to the annual precipitation) are too weak to moderate the temperature conditions.

The outburst of monsoon by mid-June checks the rise in temperature which begins to fall (total fall being around 5°C), though slowly up to September. It marks the duration of the rainy season. High relative humidity (75-85%) and widespread heavy downpours are common characteristics of this season. July is the wettest month (Fig. 16.5). The season accounts for more than 85% of the annual precipitation of the region. Occasionally the conditions become too oppressive.

With the abrupt decline of temperature (4 to 5°C) and relative humidity by October, the monsoon terminates. The state of instability prevails in the region though often the weather is fair and pleasant with average temperatures ranging between 22-24°C in Oct. and 17.5-19.7°C in Nov. The precipitation recorded owes to the delayed withdrawal of the monsoon as rainfall is seldom over 2 cm in Nov. The post-monsoon showers share over 7% of the annual precipitation.

An analysis of the rainfall regime clearly indicates the two major breaks in the rainfall dispersions¹⁸, one between May and June and the other between Sept. and Oct. Also there is marked concentration of the amount of rainfall within 4 rainy months which is of little avail for this region. Even the coefficient of variation (CV) for the seasonal distribution reads 140% or more.¹⁹ Spatially the rainfall varies from 100 cm on the northern fringes to over 160 cm in Balaghat in the south (Fig. 16.5).

Soils

The soils of the Vindhyan-Baghelkhand region are mostly sedentary, exhibiting the *in situ* development, but extensive pockets of alluvial soils also exist mainly in the Narmada—Son trough, Tons Valley, Singrauli, Dudhi, Ugli basins etc. Often the soil groups partake their

characteristics from their parent rocks. The studies made so far help in recognising as many as six broad soil zones.

1) Black cotton soil, like other such areas, has developed over the Trappean rocks of the northern Chhindwara, Narmada Valley and such adjoining areas. The soils are sticky with higher clay proportion and have better moisture-retaining capacity. With better proportion of lime these are best suited to cotton and cereals.

2) Red and Brown Forest Soil indicates the development through laterisation of Archaean and Dharwarian basements and cover extensive areas in south Chhindwara, central Seoni and central Balaghat.

3) Mixed redeposited soils of the valleys occur in the NW Narsinghpur and the upper Tons valley. Loamy to sandy loam in texture, poor in nitrogen and other organic matter, the soil is often neutral in reaction. Forests thrive well over this soil group.

4) Mixed Black, Red and Yellow soils of the Archaean and Dharwarian bed rocks fall in two groups, (a) the alluvial of the Narmada Valley which are rich in plant food and (b) the upland soils. In Shahdol these soils have developed over the Gondwanas while in Chhindwara, Sidhi and Dudhi on Dharwars (Bijawar in case of latter two). These soils have typical tinges depending on the predominance of the rock; for instance the Jungel series (red shale) gives a red tinge. These are loamy to sandy loam in texture but the variants are from coarse sandy to loamy and clayey. Often these are non-calcareous in composition.

5) Calcareous soils occupy the Belan valley and are slightly alkaline in reaction. Dark grey in colour, cloddy and indurated in upper layers, they behave like *Karail* in cracking and 'self ploi-ghing'. A variant of it is the Belan Valley clay which is rich in organic matter and slightly alkaline in reaction.

6) Red Brown sandy soil covers considerable part of Shahdol district. Leaching is quite excessive in this soil group.

Natural Vegetation

The seasonal rainfall and the nature of the

soils provide for a variety of vegetation ranging from grasses and thorny trees to deciduous trees of commercial significance like *teak*, *Sal*, *baldu* etc., in the region both in small pockets and in considerable stretches. Considerable acreage has been maintained under reserve category while those on the slopes over 25° are classed as protected forests as their further exploitation may accentuate soil erosion in the area. Though the forest cover is often of mixed variety, yet depending upon the share of a particular species (over 20%) following forest types can be recognised; 1—Dry Deciduous Teak Forest, 2—Sal Forest, 3—*Kerdhai* Forest, 4—Bamboo Forest, 5—*Salai* Forest and 6—Mixed Forest.

Dry Teak forests are mostly confined to Rewa, Satna and Sidhi districts occurring both on the hill slopes and plateaus and also in the river valleys. The associates are the *soj*, *dhawa*, *kane*, *tendu*, *baldu*, *semal*, etc. Sal forests are more extensive covering parts of Sidhi, Shahdol, Mandla and adjoining areas. About 50% of the Sal forest are reserved. These two species are of greater commercial significance to the region. All others have their local areal associations, as the species are wide-spread throughout the region. On the sandstone basements *tendu* and *baldu* dominate while in the sheltered valleys bamboo becomes the dominant species. *Khair* forests are also widespread in the region. *Salai*, however, is an edaphic type and occurs nearly all over the area in varying proportions. On the whole, the forests constitute a good source of income to the region.

Minerals

The minerals of the region are mostly non-metallic, the important being coal, limestone bauxite, corundum, dolomite and building stones like marble, slate, sandstone etc.

Coal is by far the most significant mineral and is confined to the Gondwana basins though good quality coal is limited. Important fields are those of Singrauli, Korar, Umaria, Johilla and Sohagpur, mostly lying in Sidhi, Shahdol, Surguja and Mirzapur districts. Only one field lies out of this main zone i.e., in southwestern part of Chhindwara.

Umaria coal fields (Shahdol) were the first to be opened (1882) and coal is being mined since then at the rate of about 100,000 tons a year. Barakar measures are the main source here. As many as 5 seams, four of which occur within 20 m from the surface, with thickness varying from 1.5 to 2.5 m, have been discovered. Johilla fields lie in the western part of Shahdol district. There are two areas of Barakar measures, one lying to the west of Pali and the other to the south, of which the former is important. The quality of coal is inferior containing buff-coloured ash. Covering about 12 km^2 , the seams vary in thickness from 1 m to over 2 m. Further investigations have proved the occurrences of seams under 600 m for future exploitation. By far the largest continuous coverage of Barakar measures (more than $3,000 \text{ km}^2$) is in Sohagpur (Shahdol). The coal seams are supposed to have been deposited during Damuda period. Subsequent faulting and erosion resulted in removal of some deposits, thus breaking their continuity. Main fields are Kotma, Khodargawan, Burhar, Belbahara etc. Singrauli coal fields have been opened recently. The coal obtained contains more moisture and ash which make it unsuitable for coking purposes. These may be utilised in thermal power plants and cement industries. The Dala cement factory and Obra Thermal power plants (Mirzapur) largely depend on the Singrauli fields and so also the Renuagar thermal Plant. Mining is of open pit nature. The 6 m thick seam is estimated to contain about 6 million tons per km^2 .

Limestone constitutes the second important mineral and is more widespread. Rohtas, Murwara basin, Jukehi areas and Rewa, Satna and Mirzapur districts are the main areas of its occurrence. It serves as raw material for the cement industry of the region and also forms base for the lime-kilns, so common around Satna, Katni and Umaria.

Bauxite occurs in Amarkantak, Umergohar, Miria, and Haria areas and is of poor to medium quality. The occurrences are also irregular and workable thickness is about 7 m only.

Building stones and road building materials are very common and occur in almost all the forma-

tions such as Vindhya (sandstone), Lower Gondwanas, Deccan Traps (basalts, marbles and granites), etc. Clays (brick clay, China Clay, fuller's earth, fire clay, pottery clay etc.) occur in different colours near various places such as Deohari, Umaria, Chanda etc., mostly in the Upper Gondwana formations.

Manganese ore is in abundance in Balaghat-Chhindwara zone which contains almost all of the manganese resources of the State (M. P.). Diamonds, gemstones, gypsum, glass-sand, mica, ochre, sillimanite and recently investigated copper ore are other minerals though they still await detailed investigation. Amjhor pyrites in Rohtasgarh plateau are now providing rich sources for copper and sulphur.

Physical Resource Base

The region, though yet to be fully explored, offers a variety of physical resources. The fertile black cotton soil and the alluvial soils in the river basins have ever since been a vital resource. Their efficiency can be increased through irrigation facilities by harnessing the perennial streams of the region. The rivers, with their alternating basins and gorge arrangement provide better sites for damming and storing water for irrigation and installation of hydel power projects which will give rise to growth poles like that of Singrauli basin. Such centres will attract power-oriented industries like aluminium as the Hindalco and also such factories based on forest and mineral resources. Both these resources are adequate enough in the region. Coal, though of inferior quality, is abundant and can be used for developing thermal power as at Obra and Renuagar, and based on extensive limestone deposits, cement industry as at Dala. Such developments will break the regional isolation and would give a good face-lift to this hitherto undeveloped and neglected region.

The Cultural Setting

Population

The region is one of the less densely populated parts of India as it carries a population of 9.86 million (1961) over 140,172 km² of territory, thus

providing an average density of 70 persons per km². In 1901, the population for the region was about 5.4 million over which the 1961 census registered an increase of 85.77%. There has been, however, appreciable inter-censal variations in the growth trends of population. The region exhibited decrease up to 5.8% during 1901-1911 and all the districts received a setback except Balaghat and Chakia tahsil of Varanasi which recorded 7.5% and 0.5% increase respectively. The percentage decrease was about 14% in Damoh and Sidhi districts and Pawai tahsil of Panna while others had a lower incidence. The 1911-21 decade also suffered from droughts, famines and epidemics and general lack of economic growth channels, and could hardly give a fillip to the losses sustained during 1901-11. In the overall 20-year (1901-21) growth trends, the region could attain an increase of 7.26% only, and some of the areas like the hilly Bhabua and Sasaram (2.75), Mirzapur (0.9) and Narsinghpur (0.11) still exhibited some losses over 1901; other areas, however, registered increases in varying degrees, very high in the southern plateau country (Balaghat 27.9%, Mandla 21.3, Chhindwara 20.6, and Surguja 18.0) and low in the northern districts (Satna 1.98, Rewa 3.3, Sidhi 0.3, Damoh 0.6), while most of the central districts had medium increases. From 1921, however, the region has registered a markedly upward trend which has been rather phenomenal during 1951-61.

The varying degree of extension of cultivation, and progress in mineral, industrial and urban activity in different parts of the region has given rise to varying trends in population growth over the past sixty years. As is quite natural, the areas which were relatively less densely settled and had small absolute numbers of population in terms of their size and extent of cultivable land or exploitable mineral and forest resources, have had high overall percentage population gains: Surguja (156%) with its rice bowl (Surguja basin), Shahdol (104), Mandla (115), Balaghat (102), Chhindwara (93), and Jabalpur (87, partly because of industrial urban activity) have experienced most notable increases. In most other areas the gains have been modest (over 50%) while Narsinghpur

(30.7) is the only district with an abnormally low rate of growth.

As noted, the region has relatively low density (70 per km²) and shows wide sub-regional variations. The area exhibits only few pockets of densely populated tracts especially in tahsils with large cities (Jabalpur tahsil 241), while most of the remaining population is thinly spread over. Jabalpur (126), Rewa (123), Satna (94), and Balaghat (87) are the only districts which show higher density than the regional average, most others recording between 60-70%. Surguja (46) and Mandla (52) districts show the lowest density in the region; though appreciable development has taken place, these areas still remain largely forested, extensively unoccupied, undeveloped and inaccessible. The region as a whole has extensive tribal areas which practise primitive subsistence or shifting (jhuming) cultivation which cannot afford to provide necessary base for economic development in keeping with the resource potential. Considerable parts of the remaining areas suffer from rugged topography, thick forest cover, poor and stony soil, lack of irrigation facilities, and above all, an inadequate transport and communication system. The interior of Surguja or Mandla has less than 10 persons per km² though the district densities are higher; in Mandla, the tribal Gonds constitute nearly half the population.

The Region has a more or less balanced sex ratio (969), higher than the national average and it has been so since 1901. Regional variations are not very significant though the urban influences have tended to lower the ratio of Jabalpur (924), while districts with tribal concentrations (Balaghat 1,009, Chhindwara and Mandla 1,006) show higher ratios. The rural sex ratio is as high as 980.

Owing to little urbanization, extensive dependence on agriculture, requiring constant attention, lack of means of transport and education, and various other social and cultural lags, there is abnormally small percentage of population involved in intra or extra-regional movement. In most of the districts more than 94% of the persons born stay at home; only in Jabalpur district the percentage goes below 85.

53.0% of the population of the Region comprises of workers which is higher than the national figure (43%). The high percentage is due to the relatively greater dependence on agriculture and associated primary occupations which absorb not only the males but also the females and the children. The percentage of workers is the highest in southern districts of Balaghat (60.6), Surguja (59.6), Mandla (57.8) and Seoni (57.6) which contain large tribal and aboriginal population whose women-folk and children are active workers. In these and some other districts, women constitute about 40% of the working force, and children (below 14 years) 6 to 9%. Jabalpur district (45.6) records the lowest percentage of workers along with other western districts of Narsinghpur (46.3), Damoh (47.2), and parts of Chakia (45.5) and Mirzapur (48.3).

About 84% of the working population of the Region is engaged in agriculture and other primary activities; cultivators and agricultural labourers alone form over 80% of the entire working force, showing very heavy dependence on agriculture and very low development of other sectors of the regional economy. Even in the primary sector other than agriculture, mining, quarrying, livestock-raising, forestry etc., are little developed absorbing barely 3.4% of the working force. Surguja, as compared to other districts, has the highest percentage (87.2) of agriculturists; it is here also that percentage of cultivator-owners of land is particularly high (76.88%) as against 60.8% of the Region as a whole. Very negligible percentage of working force is employed in services (10.8) and industries (5.4) which are overwhelmingly household industries; tertiary sectors or large-scale factory industry are conspicuous by their absence in most of the region.

The region is one of the least urbanized parts of the country with only one-tenth of the population as urban. Regional variations are quite significant ranging from almost nothing (Sidhi 0.9%) to over 37% in Jabalpur. The western districts around Jabalpur are much more urbanized (Narsinghpur 11.9, Damoh 12.7%) as compared to the southern (Mandla 4.8, Balaghat 5.7%) and eastern (Surguja 4.2) districts which are practically rural and more tribal.

Population—an Ethnological and Cultural Analysis: The Region is characterized by very heterogeneous elements of population with diverse cultural and economic levels ranging from very archaic and primitive to very advanced and modernized traits; this characteristic very much affects the human resource potentials of the Region. The population may be classed into tribals, scheduled castes and others for a broad analysis.

The tribals represent a wide variety of population element with varied social, techno-economic, and cultural levels of development and widely differ in customs, habits, languages, religion, beliefs and sentiments, and most significantly in their responses to the processes of Sanskritization and modernization and induced or superimposed attempts to bring them into the national egalitarian mainstream.²⁰ The various students of tribal problems have emphasized that each tribe or tribal group has its 'problems and prejudices which need differential attention and analysis' as well as specific treatment in any planning efforts.

The Region has a number of tribals—Gonds, (Chhindwara, Mandla and most other districts), Halbas (Chhindwara, Mandla), Bharias (Mandla), Bharais (Mandla, Chhindwara), Baigas (Mandla, Balaghat), Karwars (Surguja), Korkus (Chhindwara), and several other smaller groups.²¹ The Gonds are numerically and historico-politically the most important tribe in the region. Though once rulers of great regional importance during 15th-18th centuries, they now do not constitute any distinct tribe, and have developed into several occupational castes such as Agaria, Ajhas, Pradhans, Sotahas etc. The Raj Gonds and Khatolias are the aristocratic lines; the former are perhaps the products of the marital alliance with the Rajputs and being important landholders, they count high in the Hindu caste hierarchy.²² Formerly being hunters and fishermen, Gonds are now engaged more in agriculture, both as cultivators and agricultural labourers and also as forest and mine labourers. In some areas they still practise jhuming, locally known as *dbaria* or *bewar*, and sometimes prefer to pay a fine to follow this ancient method of growing crops. A very proud people, with great aesthetic culture,

most of the Gonds have been reduced to poverty now owing to exploitation by outsiders and due to cultural lag over ages.

The Halbas, a primitive people, have now mostly taken to cultivation and are efficient husbandmen, though some still continue jhuming against the rules. Bharias (only 23,000 in M. P.), appear to be of mixed origin from the Baigas and Karwars and are more Hinduised and enlightened and are mainly field agriculturists. The Bharias, (22,961 in M. P.) who have probably descended from the Bhars of Eastern U. P., are both cultivators and field labourers, and have also taken to basketry and weaving. The Baigas (90,095), primitive tribe of Dravidian origin, are mostly found in Mandla district where they have been allotted a special area where shifting cultivation is legally permissible; in fact, they refuse to settled cultivation there, though they are doing so elsewhere. They still draw substantial resources from forests. The Karwars (216,000) are more Hinduised now and apart from agriculture, they serve in factories nearby and also supplement their sustenance from the sale of forest produce. The Korkus (173,000), Hindus now, are divided into several occupational and totemic groups. They are mostly agriculturists and forest-labourers and earn also by collecting and selling forest produce.

The Gonds are found at different levels of cultural, economic and social organization, depending on the nature of the ecological isolation, culture contact and resources of their habitat. Most of them are now sedentary agriculturists, though some, like the Hill Marias, still practise jhuming in isolated pockets. The Gond society is based on initially localised totemic clans, which tend to cluster as *gotras* or phratries or even group into two exogamous moieties. According to Fuchs, two different systems of social organization, the territorial and geneological, merged, and as such, the territorial unit of the *Garh* corresponded with the territorial unit of the class or *clan*. The original territorial-group system of the Gonds "was somewhat modified in the whole of Gondwana, and gradually developed into the present *Garh* system through the influence of the Rajput

soldiers and landowners domiciled in the Gond area".²³

Through various processes of Sanskritization, the affluent classes of the Gond society tried to scale up the Hindu caste hierarchy, and gaining Kshatriyahood has been their aim over the centuries. Though the Gond kingdoms long perished, "the social stratification and associated aspirations to be regarded as Rajput Kshatriyas still persists". Raj Gonds and Khatolias are aristocrats, while the Dhur Gonds or ordinary peasants are of lower status. The Raj Gonds now rank with the Hindu cultivating castes. Fuchs finds four-ranked strata among the Gonds of Mandla district from the highest teetotaler Deo Gonds through the Suryavanshi Raj Gonds (claiming descent from Rama), and the Suryavanshi *Deogarhi* (the sun-born Gond of Deogarh) and the lowest, the Ravanvanshi Gonds. The two Suryavanshi Gonds regard themselves as Kshatriyas and there is a reformist movement for their complete absorption into Hindu fold with the rank of Kshatriyahood. The Ravanvanshi Gonds eat beef, sacrifice pigs and drink liquor. Ritual displays, observing Hindu festivals, living pure, and keeping Brahman priests are the various methods for upgrading one's caste. This attempt brought many economic and technological changes and resulted in the modification of regional culture. Settled agriculture with the plough, change in crops and cropping pattern, residence in permanent villages, irrigation through *bandh*, introduction of such castes as potters, blacksmiths, basket-makers, even sponsoring of weekly markets etc. and use of various implements in field agriculture, led to the technological transformation of the tribal economy and social stratification.

Rural Settlements

The Region is predominantly rural in character with about 90% of its people living in 24,525 villages of different sizes. In general, the villages are small in size (below 500 pop.) in consonance with the nature of the broken country with scattered development, and account for over 78% of the total number containing about 45% of the rural population. With low medium-size villages (500-999), the percentage rises to over 94. There

are wide sub-regional variations—in all the districts except Balaghat (21.2%) over 40% of the villages are small and range over 50% in other southern (Chhindwara 52, Seoni 59 and Mandla 68%) districts which are more hilly and have more tribal element in population. Low medium-size villages numerically account for one-tenth to one-fifth in most districts, the percentage exceeding only in Balaghat (27.6) and Surguja (22.6). As is natural, the low medium and high medium-sized villages, numerically being 16.3 and 4.6% only have over 31 and 17% of the rural population respectively. Large-sized villages, being below 1% in number contain about 7% of the population. Balaghat district registers over 34% of its rural population in high medium-size villages while all others range about half of it, and Mandla less than one-fifth.

The Vindhyan-Chal-Baghelkhand is a region of relatively dispersed type of settlements with clusters of compact and semi-compact settlement in the fertile valleys and flat plateau lands: both the type and patterning of settlements exhibit the dominant control of terrain in consonance with soil, hydrography, vegetation cover, and the nature of general development. The factors of dispersal are widespread and dominant all over: the valley, basin and plateau surfaces punctuated with ridges and scarps conspire with irregular distribution of alluvium, general poverty of soil, seasonal river regimes, low watertable, need of terracing for agriculture, large expanse of impenetrable forest, and presence of tribal people, to provide few spaces, except in the open valleys and expansive plateaus, for compact settlement.

In the valleys between parallel ridges the dispersed settlements take linear patterning usually along the tracks, the rivers and the other rows skirting the foot of the ridges (Fig. 16.6). In the narrow valleys, settlements dot the spurs overlooking the valley which contain the cultivated area while the forests above the valley bottom provide land for grazing, and in case of tribals for jhuming.

Extensive ridge-tops also provide sites for settlements, particularly as a legacy, when they were crowned with defensive forts and settlements

SETTLEMENT PATTERNS



Fig. 16.6

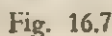
clung to them, and when also several pockets of Jhum lands lay closely for the freelance tribal hunters-gatherers-cum-jhumers. In fact, this multi-faceted tribal economy in this broken terrain necessitates the dispersal even now : grazing and tending the livestock needs extensive land, too difficult to manage from a central site, while the fields run all over the slope for a considerable distance from the top to the bottom of the valley, which is terraced, and if rice or wheat lands need water, embankments have to be carefully and constantly watched needing the ready attention of the families located on the ridge top or about the middle of the valley slope.

On the plateaux and table-lands, the extent of compactness and size of settlements widely vary : where the cultivated lands are patchy, the settle-

ments are small and unevenly distributed, while small to medium size hamlets and semi-sprinkled villages have grown up in the valleys where the surface is studded with artificial tanks for irrigation. The Belan and the Ghaggar valleys on the Vindhyan plateau of Mirzapur have closely set small to medium-size villages owing to facility of tank, well and canal irrigation. Eastwards on the Rohtas plateau settlements have generally grown near water points or pockets of depressions where cultivation could be carried out and livestock could be maintained on the surrounding uplands. Barwan Kalan, though small in size, is a compact settlement and has grown near such a water-point. The few roads and tracks traversing the plateau have helped in higher nucleation, particularly along track junc-

perennial streams or impounded tanks. In the secluded but cleared alluvial basins, settlements get denser but one rarely finds more than a few nucleated type. Westwards, the more open of the valleys, i.e., the basins of Narmada and the Wainganga with level topography, rich black soil, plenty of surface and ground water and agriculturally productive, with rice and/or wheat lands have medium to large compact settlements, the inter-spaces ranging between one to three km. The Haveli wheat lands of Jabalpur or the Ugli rice tract of Balaghat are dotted with such settlements.

As is natural, the typical rural settlement in most of the cases consists of a number of hamlets, each generally of a different caste, a relatively larger central site with the dominant caste and mixed population and several dispersed hutments with tanks or water holes (Fig. 16.6 C). The village Deoghata (pop. 313) on the Son in Gopad-Banas tahsil (Sidhi) provides an example. Unlike the



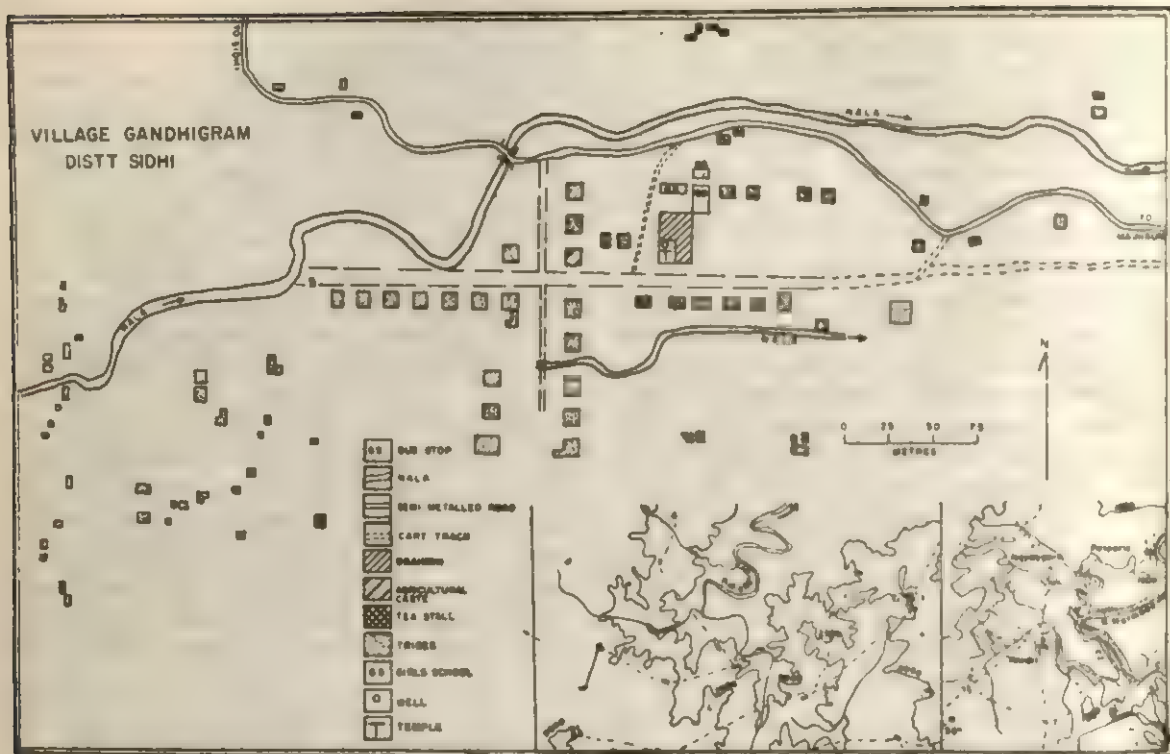


Fig. 16.8

congested and huddled plain villages, the dwellings are wide open even in the central site. As such, there are larger enclosures, as *angan* with rooms all around in the case of high caste dwellings, but usually on the backyard of the low caste houses, open or enclosed by one to one and half m high wall or hedge. The usual building materials are mud, straw and bricks or stones, and tiles and straw are the thatching materials. Roof structures use timber and bamboo extensively.

Though there are still isolated settlements of tribals, such as Cheru villages of Korea, Baiga village in Balaghat or Karwar village in Surguja or Rohtas plateau, most of the other settlements have also assimilated the tribal elements. In Deoghata, where a naturally assimilated centre under the process of acculturation has taken place, tribals like Kols and Gonds form an important element. In the planned village of Gandhigram also, tribals form an important population group; in fact, this has become part of the regional cul-

ture. Such planned villages with distinct house plots and with some modern amenities are coming up in the Region (Fig. 16.8). Newly emerging mining settlements also show such tendency.

Wherever settlements have grown in the open country, there has developed a good network of local transport and communication which binds them together and also with the outside world through local village markets. In the fertile and extensive plateau lands (600 m elevation) of Chhindwara, where nucleated settlements have almost evenly grown, the larger and traditionally important centres have developed markets where *bats* are held on fixed days. Adegaoon and Mandhi may be taken as examples in point.

Jugail is a large size tribal village on the Bijul River (area 41,866 acres and 1968 est. pop. 7,589) in the Agori upland region which is largely jungle-clad and highly dissected. Only 10% of the area is cultivated and that too is highly patchy, each of the patches being occupied by large or

small hamlets numbering as many as 40 (Fig. 16.9). The population consists mainly of Bhuiyan, Kharwar, Gond, Kol (all cultivators), Bhurtia (cattle herders) and Chero (service class); some intrusions have been made in the village by shopkeepers (Baniyas and Telis), Kayasthas and some other artisans. A significant feature of the village is its grouping into five blocks, distinguished on the basis of the social structures of the people inhabiting different hamlets, such as *Jugail* block

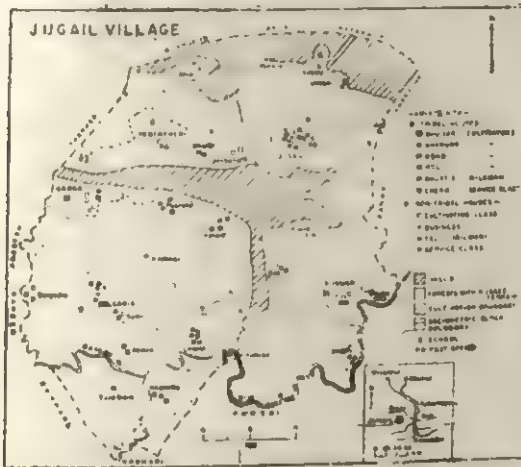


Fig. 16.9

after which the village is named, *Panchpheri*, *Kunwar*, *Garda* and *Belgadia*; *Jugail* and *Belgadia* blocks have the privilege of a primary school and a post office serving the entire village.

Urban Centres

There are 51 urban centres in the region with just over a million people (about 10% of 1961 Population). The process of urbanization, though set in, has yet to involve large population; the regional economy in the different areas, as of now, is too underdeveloped and undiversified and the sub-regions are too isolated to push in the process. There is no hierarchical urban development either, and the highly inadequate rural-urban linkages are reflected in the lop-sided urban structure. Jabalpur town group (3,67,014) is the only Class I city, sharing over one-third of the total urban population and keeping almost a void below as Murwara

town group (60,472) is the only class II city in the region. The six class III towns are mere isolates as the eponymous district headquarters in the vast rural islands of their surroundings, accounting for slightly over one-fifth of the urban total. Fourteen Class IV towns sharing another one-fifth of the urban population are district headquarters like Mandla (19,416), Balaghat (18,990), Narsinghpur (17,940), Ambikapur (15,240) or tahsil centres or also mining (Umaria 11,277) or industrial (Pipri 11,296 or Kymore town 12,319) centres. Remaining centres have population below 10,000 and most of them are tahsil or mining-industrial centres with commerce and rural service as other important functions. Most of the urban centres in the Region still retain the legacy of agricultural activity as they have risen from rural origins. It will be evident that most of these centres enjoy their location on railway and/or roads, a factor which is necessary for their functioning as such. Although the urban centres have gained in population by 332% during the last six decades, in absolute numbers of total population the figures are unimpressive. The post-Independence period has witnessed a sharp rise, yet the overall impact is meagre over the countryside. Their growth is hampered because of lack of their linkage with the rural population distributed over their natural umland. As such, rural areas are inadequately served, as even market villages are few and far between and are ill-equipped.

Jabalpur (23°10' N—79°59' E), the second largest city of Madhya Pradesh, is sited centrally in the State in a rocky basin surrounded by low hills, about 10 km from the Narmada river, and has become a natural route junction on Allahabad Bombay route. Meticulously laid out with broad-regular streets, the city has emerged as an important regional centre with wholesale commercial establishments, two universities, the cantonment, the ordnance factory and other defence installations, telecommunication industries etc.

Murwara (23°50' N—80°24' E), also known as *Katni*²¹ after the Railway junction, is sited on the raised ground between the Katni and Sumrar rivers, and has developed into an important-

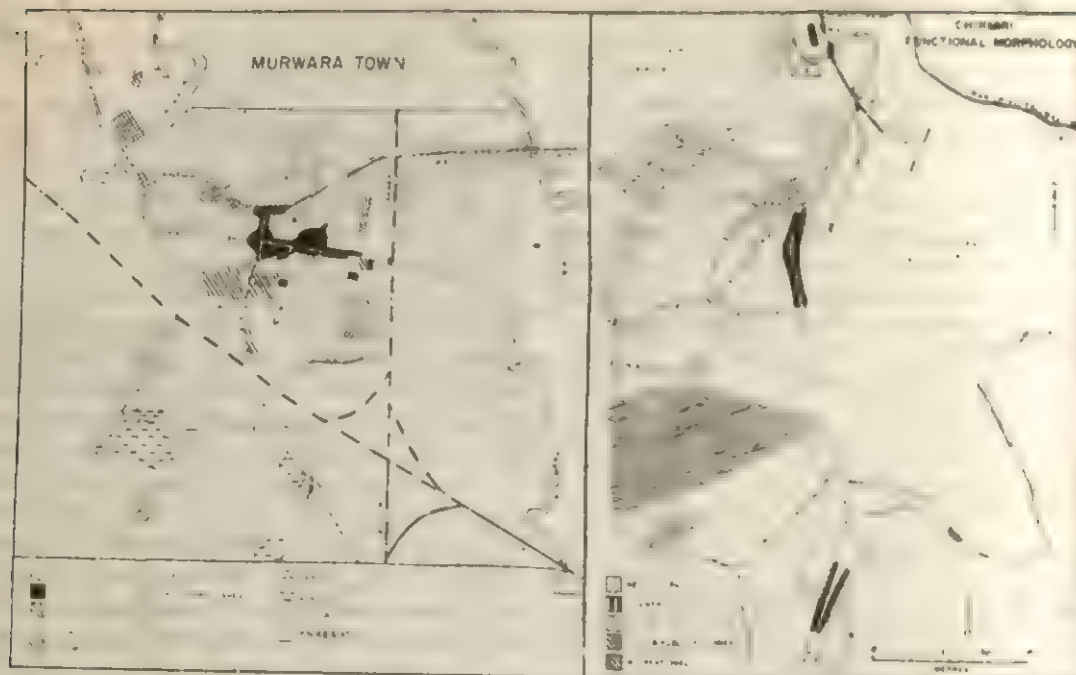


Fig. 16.10

industrial, commercial and transport town (Fig. 16.10). Long famous for its limeworks, owing to occurrence of limestone in the surrounding areas, industrial activity employs over one-fifth (22.8) of its workers, and another one-fifth is in trade and commerce (21.7). Originally well set in between the two rivers east of Rewa-Jabalpur road on the west, Allahabad-Jabalpur rail road on the east and Bina-Bilaspur rail road on the south, the town developed triangularly with its base towards the open north, but is now taking amorphous shape and linear extensions (mostly industrial, mining and institutional) on both sides of the Rewa-Jabalpur road with some other isolated nuclei. The city has developed a distinct commercial zone along the station road, around which has developed a vast residential zone. The railway colony is distinct in the east. The civic institutions have developed south-west of the station road. The outskirts, particularly the lowlands along the rivers, have the usual farming lands.

Chirmiri (1961 Pop. 6,563) is a typical small mining town in Surguja district whose popula-

tion and activity patterns pulsate with its colliery activity.²⁵ Recognized as a town (10,044) in 1941 it was declassified in 1951 and again recognized in 1961. Railway from Mahendragarh approaches here and quite naturally several coal depots are found near the station. The town has developed on the west of a stream flowing southwards. There are some shops along the main road running parallel to the stream and going to the Duman hill colliery. Most of the public buildings and service institutions have developed toward the south in the fork of two nalas (fig. 16.10).

Satna (24°34' N—80°50' E, 1961 Pop. 38,046) on the Jabalpur-Allahabad rail road, formerly the headquarters of the Political Agent of Bughelkhand is now the district headquarters of Satna. It is a developing centre and has almost doubled its population during 1951-61. Commerce, industries and administration are its main functions and it is developing into a regional centre with several institutional developments. It is also important rail-head centre for Rewa.

The town is well laid out east of the river

Satna, and the commercial area has developed east of the railway station and colony in rectangular blocks. Educational and other institutions are found to the north and west in pockets while the civil lines are on the north-west. Industrial development has occurred north of the Rewa road in the east.

Agriculture

The regional economy is very much undeveloped and highly unsectoralised, and even the primary activities, which are the chief means of subsistence, are mostly unremunerative and unsystematic and are still, to a great extent, affected by the primitive tribal cultural and economic elements.

Agriculture is the principal activity, yet the net sown area is less than one-third (31.6%) of the total land : in eastern districts it varies between 1/4th to 1/5th of the total land (Sidhi 24.3, Surguja 21.5%), between one-fourth to one-third in Southern districts (Balaghat 28.2) but is high (up to 2/5th to one half) in the western districts (Jabalpur 40.5, Narsinghpur 48.2). The percentage of fallow (8.0) and cultivable (13.7) land is high, and the latter is over 20% in Damoh and Jabalpur. Even this net sown area comprises marginal lands which have been put under plough under the Grow More Food Campaign and Land Hunger. On village level, in fertile pockets, this hunger for land has led to such extremes that there are no grazing lands left or even adequate standing grounds for cattle. As of now, most of the waste lands are now in small pockets, almost 4/5th of the total being in blocks smaller than 15 acres in M. P., though they are larger in this Region.

There are, however, great local variations even in a small sub-region or tahsil depending on the nature of terrain, soil cover, and more particularly the measures and extent of irrigation and type of agriculture. The Ugli rice tract of Balaghat, the Haveli of Jabalpur, the Ambikapur basin of Surguja inhabited by field agriculturists of non-tribal character are found as a contrast to many similar terrain pockets in the Region inhabited by tribals. The Kurmis, the Lodhis, the Mawars etc., work laboriously on preparing field embank-

ments not only to conserve the soil but also for irrigation and take constant pains to eradicate the *Kans*, which spurious weed is the bane of agriculture in the Region.

Village Deoghata in Sidhi district is of a rather more than average agricultural importance where out of total (284 acres), about 53.8% of land is net sown, 3% under fallow and as much as over 30% as uncultivable waste. The percentage there of rabi (50.9) and kharif (49.1) crop is almost equal; about 56% of the crop-land is devoted to cereals, and 33% to pulses and most of the rest to oilseeds, fruits and vegetables. Quite naturally, millets (31.4%) are dominant among the food crops followed by rice (9), barley (9), wheat (4) and maize (3). Irrigation is almost a totally neglected affair in the village and only 0.2% of the total crop-land is irrigated by a few wells.

Irrigation and Double Cropping : Only 13.2% of the total cropped land is double-cropped which indicates in large measure the very low extent of irrigated land in the Region, though most of the rice fields are double-cropped on the basis of rain-fed moisture retained in the fields.

In fact, double cropping in the absence of irrigation facilities "wholly depends upon the exigencies of late monsoon. It is the copious late monsoon downpour which provides sufficient moisture to the soil for raising a second crop". It is estimated that about 2 to 5% and in some areas much more of the net-cropped area is double-cropped in favourable years. This is usual in the case of the rice fields near the villages or artificially embanked wheat fields or naturally depressed fields. High prices also augment double cropping.

Out of about 11 million acres under net sown land merely 4% is irrigated. About 45% of the total irrigated land in the Region is in Balaghat district followed by Mirzapur (14%) and Seoni (9%). Irrigation is negligible in most of the other districts. Tanks, wells and bunds, and various other locally ingenious methods are utilized for using the locally available water. Tanks are more significant in southern districts (Balaghat 47%), while ordinary wells become significant in Satna (68%), Rewa (51%), Shahdol (60%),

Sidhi (51%), Mandla (50%) and very dominating in Narsinghpur (92%) and Chhindwara (96%). In Satna tube-wells (6%) are getting more important.

Cropping Pattern and Crop Combination Regions : Most of the cropped land is devoted to food crops. Regionally, rice is dominant, sharing over 30% of the cropped land, and wheat with half of the average (15.8) is a poor second. Gram (9.3), jowar (7.4) and *arhar* (2.7) are other important crops. Rice takes 57% and 53% of cropped land in Balaghat and Mandla and 49% in Chakia, and is the first crop everywhere except in the western districts where the percentage attained by wheat is 36% in Damoh, 27% in Jabalpur, 16% in Narsinghpur and 25% in Satna; in Rewa where rice is dominant, wheat also takes about 19% of the cropped land. Jowar, barley and maize are other important crops while the various small millets like *kodon*, *kutki*, pulses like peas, *masur* and oil-seeds like *til*, mustard etc., and commercial crops like sugarcane and cotton are only locally important. Gram, though a third crop, shares about one-fifth of the crop-land; elsewhere it is also grown but is insignificant in Surguja (0.9%) and Shahdol (4%).

Rice-gram combination has developed in the north-eastern plateau lands except in Chakia where wheat replaces gram while westwards in Satna and south-central parts rice-wheat-gram form an important trinity while fourth place is taken by jowar in Seoni and Satna and maize in Shahdol-Balaghat region. Rice is followed by wheat, maize and gram in Shahdol while in Surguja maize is second to rice, followed by gram and wheat.

The wheat zone has developed in the relatively drier western part of the Region. Wheat-rice-gram-jowar zone is found in a north-south belt from Satna to Seoni towards the east. Westwards the combinations change : in Damoh jowar relegates gram to the fourth position while in Narsinghpur rice is placed in the fourth place by gram and jowar respectively next to wheat. Only in the south-west jowar becomes the predominant crop in Chhindwara followed by wheat, gram and *arhar*.

Industry and Transport

The Region is a big void on the industrial and transportation map of India and the development of other infrastructural elements is hopelessly absent except in the western part in Jabalpur region and recently in the Mirzapur-Rohtas plateau areas. Though the region is rich in coal and other mineral and forest resources, yet the industrial and power development based on these resources within the Region is meagre. The rich limestone and coal resources have been utilized, however, for the development of cement industry at Kymore township (Katni), one of the biggest cement factories in India together with the asbestos works in Jabalpur district. The newly constructed units are at Satna on Rewa Plateau, at Churk near Robertsganj on Mirzapur Plateau on the newly constructed Chunar-Chopan-Garhwa-Road rail road, and at Kalyanpur (Banjari) near Rohtas on the Rohtas Plateau served by the Dehri-Rohtas-Chutia line. Lime works have long developed in the Katni-Jukehi and Satna-Maihar area. Jabalpur has three ceramic factories while one unit is at Shahdol, manufacturing refractory bricks, stoneware, pipes, refractory cement and crockery. Other non-metallic industries are brick and tile factories and one glass factory at Jabalpur, and also spun and hume pipe plants and stone-dressing and crushing works. Jabalpur has also some chemical and metal-based small engineering units for miscellaneous products including transport equipment.²⁶

Based on Rihand power, one large aluminium factory (Hindalco) has been established at Pipri which utilizes the bauxites of Bihar. It is the biggest industrial unit in the Vindhyanal-Baghelkhand region and has made the Pipri area and the newly planned Renukut industrial township the growth pole of the region with the associated transportation and power development. These developments have indeed brought about a pleasant transformation, though within a limited area, of the tribal landscape. If the Amjhor pyrites, newly found, could be locally processed, the resource would provide for another region-building industrial unit.

Saw milling, lac, *barra*, and bidi-making are the

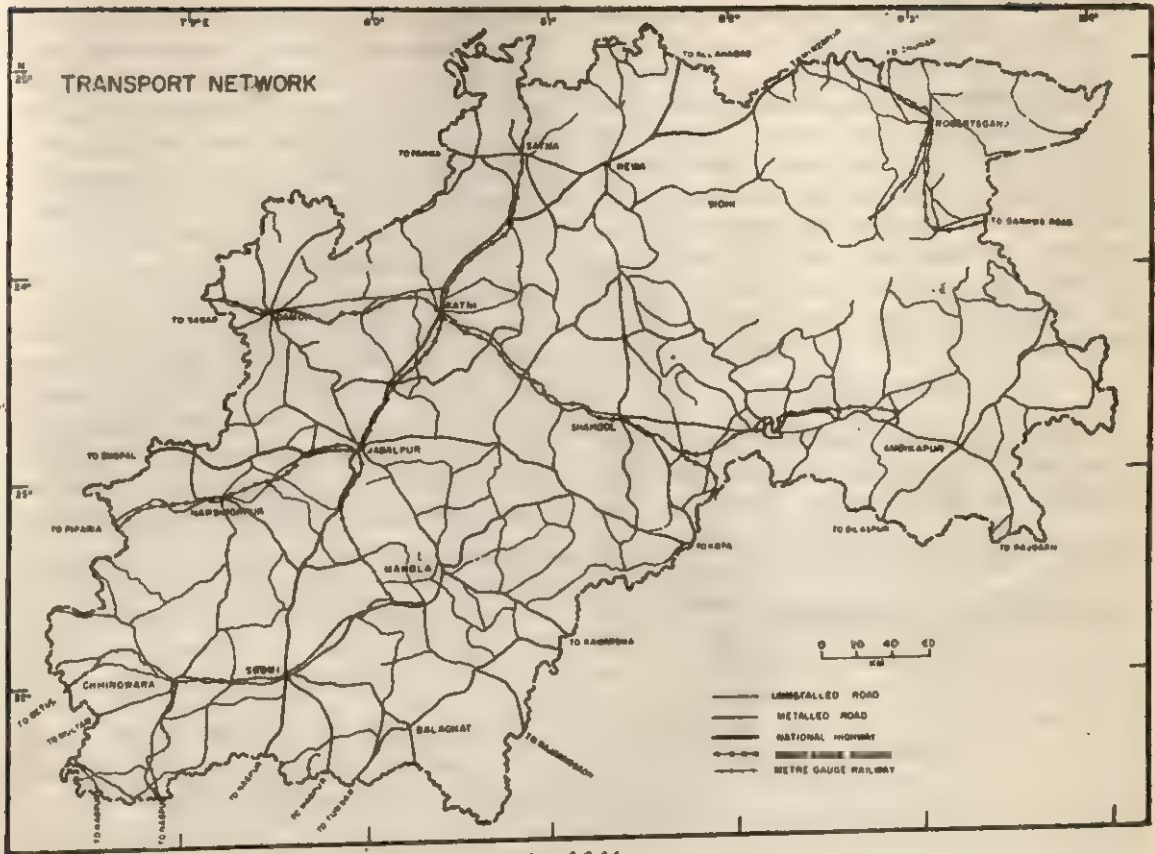


Fig. 16.11

forest-based industries which are widespread on cottage and small scale operations. Jabalpur with 38 saw mills is the largest centre for saw milling in M. P. and Chhindwara and some other centres in Rewa region also have developed a few small units. Lac industry is found in Surguja. Agro-industries include cotton textile mill at Jabalpur and some rice-husking units, others being the small flour, *dal* and oil-press units, mostly located in Jabalpur Region.

Allahabad-Bombay rail road passes through the western fringe of the Region utilizing the Jabalpur gap. Jabalpur and Katni on this line have become important route centres and railway junctions : Jabalpur, at the head of the Narmada trough has developed its nodality by easy approaches to the north towards Allahabad and south to the Wainganga valley and the Deccan; through

Katni passes also the Bina-Bilaspur link helping the region to negotiate directly with trunk routes of Delhi-Bombay and Calcutta-Bombay and the collieries in the region. Chhindwara is another junction from where the rail line goes to Seoni and onwards to Nainpur on the Jabalpur-Gondia link via Balaghat. These two links have served in the exploitation of manganese. In the north-east the newly constructed Chunar-Churk-Dudhi-Garhwa Road railway has been an important link with the Delhi-Calcutta railway system and the Katni-Chopra line passing through the Singrauli coalfields will open up the interior of the region. However, the vast Surguja-Sidhi-Shahdol areas remain unserved and unlinked (Fig. 16.11).

The road accessibility is also highly inadequate.³⁷ N.H. 7 (The Gt. Deccan Road leading to G. Comorin) passing through this region joins Rewa,

Katni, Jabalpur and Seoni to Varanasi in the north and Nagpur in the south. N. H. 27, bifurcating from N.H. 7 at Margawan, leads to Allahabad. N. H. 12 (partly completed) passes through Jabalpur. N.H. 26 links this region via Sagar and Jhansi to Delhi. The eastern and central districts are highly inaccessible, and what roads exist turn into impassable routes in the monsoon season. Recently Varanasi-Bilaspur and Varanasi-Rewa roadways services tend to provide direct access for this region to the Great Plains, a sort of revival of the ancient Deccan road.

The Regions

This physico-cultural complex within its limits encompasses areas of distinct geographic dissimilarities at different levels. The region was

under dozens of different size rulerships with various scales of political, economic and social backgrounds. To a large measure no organised local, and much less, the regional efforts were made to develop the regional economy and culture. Broadly, the Vindhyan scarps overlooking the trough stand as a distinct demarcation between the (31) Vindhyanchal-Baghelkhand North and the (32) Vindhyanchal-Baghelkhand South. The Narmada Son trough lying to the south of this scarp, though geologically a part of the Vindhyan country, is rightly included in the South as it opens more, physically as well as culturally, to the south. The areas lying to the north of the scarp show more uniformity in structural formation (near-horizontal strata) and have relatively better access to the Great Plains. The sandstone platforms,

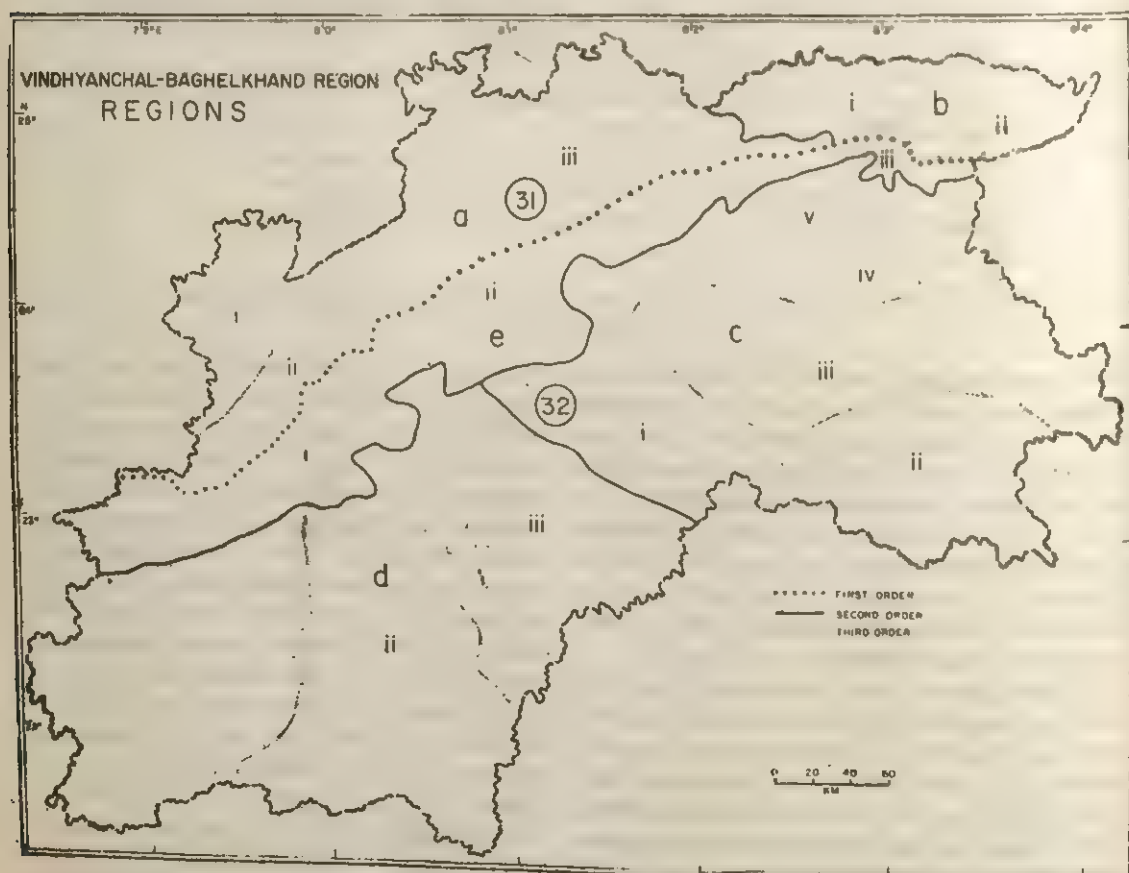


Fig. 16.12

with more barren rocky stretches and geologic uniformity, make it more distinct than the Hill-Basin-Table land complex of the South primarily evolved on the formations ranging from the Archaeans to the Deccan Trap. The overall underdevelopment of the region is a general feature. The agricultural and mining pockets induce more distinct lower-order variations; the Surguja Basin, the rice bowl of the region and the Sohagpur coal mining area stand as examples in point. Similarly, the focal point at Jabalpur could carve out, within limited surroundings, a more distinct pocket of modern human activities in the vast tribal land around. Over and above, the superimposition of administrative frame is more effective in regionalisation of this vast region of wilderness. Thus the two first order regions have been distinguished into five second order and sixteen third order units, per following regional scheme, which may be further subdivided into lower order units after detailed studies (Fig. 16. 12).

Regional Scheme

XV : Vindhyanchal-Baghelkhand Region

31. Vindhyanchal Baghelkhand North :

- a) Rewa-Panna Plateau
 - i) Sonar Upland
 - ii) Bhanrer Range or Damoh Plateau
 - iii) Rewa Region.
- b) Mirzapur-Rohtasgarh Plateau
 - i) Mirzapur Plateau
 - ii) Rohtas-Bijaigarh Upland.

32. Vindhyanchal-Baghelkhand South :

- c) Baghelkhand
 - i) Sohagpur Basin or Shahdol Region
 - ii) Surguja Basin or Ambikapur Region
 - iii) Deogarh Upland
 - iv) Singrauli-Dudhi Basin
 - v) Sidhi-Agori Upland.
- d) Chhindwara-Maikal Plateau
 - i) Chhindwara Plateau
 - ii) Balaghat-Mandla Region
 - iii) Maikal Plateau Region.
- e) Narmada-Son Trough
 - i) Narmada Trough
 - ii) Murwara Basin
 - iii) Son Trough.

Vindhyanchal-Baghelkhand North

The Rewa-Panna Plateau : Between the Bundelkhand and the trough, including districts of Rewa, Satna, Damoh and Pawai tahsil (Panna), is a region of a series of stepped plateaus girdled on either side by the wall-like massive Bhanrer and Kaimur ranges (450-600 m) rising above the Tons and Sonar valleys. It can be divided into three sub-units. *Sonar upland* is drained by the Sonar and has relatively more level agricultural lands. The district headquarters, Damoh (46,656), subdivisional headquarters Hatta (9,117) are local service centres of significance in the Sonar valley. Amanganj, another rural service centre is developed along the Panna-Damoh road at a point where a road from Pawai joins it. *The Bhanrer Range* (Damoh Plateau) is the highly dissected massive sandstone range and has highly scattered rural population. On its eastern flank, skirted by the main railway line and road, important service centres like Maihar (12,115), Unchahra (7,447), etc. have developed. Rural central places like Jukehi and Amdara further southward are notable. On the western flank, Pawai on the Patan river has emerged as a subdivisional headquarters, though mostly rural in character. *Rewa region* is distinguished from the other regions of Vindhyanchal in that it has the highest percentage of arable land (51%) and lowest proportion of forest (9%). Rice, wheat, gram and jowar are the main crops. Rewa (43,065), a class III town and a nodal centre, is also the regional centre of the area, being wellconnected with Allahabad and Varanasi. Satna (30,046) is a district headquarters with significant commercial activities. Govindgarh is another small service centre south of Rewa. Amarpatan, though small is of great commercial significance. *Mirzapur-Rohtas Region* typically represents the Vindhyanchal in physical characteristics with significantly developed pockets and ribbons. It is divided into two regions of third order : the *Mirzapur Plateau* has witnessed significant development, agricultural through canal irrigation, and industrial with Rihand power. The Belan representing an alluvial-filled synclinal basin is a ribbon of prosperity in contrast to the rest of the Plateau surface and may be treated as a distinct fourth

order region. Robertsganj (6,584) and Churk have developed as service-cum-industrial centres and are directly linked with Mirzapur and Varanasi in the north and Sonpar on the south since the construction of the Chopan bridge. The *Bijargarh-Rohtas Upland* is a relatively more dissected and highly underdeveloped region. It is here that subterranean caves (Khoh) and elongated stream gorges mark the physical landscape and often serve as hideouts. It is mostly used as summer pastures for the foothill plains. The Kaimur limestone and Amjhor pyrites tend to provide opportunities for economic development. On the southeastern flank Banjari has developed as a centre of cement industry. The massive Rohtas fort is of great historic significance in the east and the Bijaigarh fort in the west.

The Vindhyanal Baghelkhand South is more extensive, wilder and inaccessible except the western fringes. Three regions of second order have been distinguished: (c) The Baghelkhand, (d) The Chhindwara-Maikal Plateau and (e) the Narmada-Son trough.

Baghelkhand is a part of the historico-cultural region deriving its name from the heroic Baghel Rajputs of the medieval ages. Formerly the Baghelkhand consisted of a number of princely states forming part of the erstwhile Vindhya Pradesh before 1956. It is a typical upland-basin complex developed largely on the Gondwana basins. It can be subdivided into five sub-units. *Sohagpur Basin* is traversed by the Upper Son and its tributary Johilla. It is distinguished by coal deposits and associated mining activities. It has given rise to several mining towns and rural service centres. Shahdol (22,196) is the district headquarters. Umari (11,277) is purely a mining town. Burhar (6,481), Fali Birsinghpur etc. are the commercial centres. Gaurela is a mining centre. More than 40% of the basin is forested and about 1/4 is cultivated.

The *Surguja Basin*, also known as Ambikapur Region is the basin of upper Rihand and of the upper Hasdo (tributary of the Mahanadi). It is more extensive but less accessible. Ambikapur (15,240), formerly the capital of the state, is the regional centre and district headquarters. Ma-

nendragarh (9,807) on the Hasdo is a commercial centre with large number of non-agricultural villages surrounding it and Chirmiri (6,563) is a coal mining centre. Baikunthpur (3,262), formerly the state capital of Korea, is now a service centre on the Ambikapur-Manendragarh-Shahdol road. There are a number of non-agricultural villages. It is also the rice bowl of the Region. *Deogarh Upland* in contrast to Shahdol and Surguja basins, is a highly dissected and inaccessible upland country drained by the tributaries of the Son. It is characterised by highly scattered tribal population which lives by rudimentary agriculture and forest produce. However, some concentration of population can be marked on the margins of the basins. *Singrauli-Dudhi Basins*, though separated from one another by a neck of hilly country, are similar in physical character. However, with the coming up of the Pant Sagar-Renukut complex, the Singrauli Basin has assumed a distinct personality. Redistribution of population of the submerged part of the basin by the Pant Sagar has resulted in the changing of rural settlement pattern.²⁰ Singrauli coal measures are being worked out to augment thermal power. Renukut-Pipri township (11,907) is worth noting. Dudhi Basin, though now linked with rail and road, is still tribal in character. *Sidhi-Agori Upland* is characterised by east-west running parallel denuded ranges with intervening valleys. In degree of dissection, it resembles the Deogarh Upland. The bridging of the Son at Chopan and provision of rail-road link, the thermal power station at Obra and the cement factory at Dala, all in the eastern section are tending to recall the former glory of the stronghold of Agori fort.

Chhindwara-Maikal Plateau Region is characterised by Deccan Trap capping wherever not removed by the headwaters of the Narmada and the Wain-ganga, which together help to divide the area into three units (i) the Chhindwara Plateau in the west, (ii) the Maikal Plateau in the East and (iii) the Central Basins, i. e., the Balaghat-Mandla Region. *Chhindwara Plateau* is more level, less dissected, much more densely populated and accessible than the Maikal Plateau. As much as

40% of the area is under cultivation; further, the region is famous for its manganese mines and along with Balaghat it is the main producer of manganese in the country. Chhindwara (37,244) is the largest town, a transport node and regional centre. Seoni (30,270), another district headquarters is mainly an industrial centre. *Balaghat-Mandla Region*, with north-south disposition, partakes the character of the upper Wainganga and upper Narmada Valleys, draining in opposite directions on one hand, and on the other Balaghat is much akin to Chhindwara while Mandla to Maikal. Thus Balaghat region and Mandla region become two distinct lower order regions with valley-head route centre at Nainpur (13,728). *Balaghat region* with yellow and sandy soil developed on metamorphic rocks produces rice with irrigation and is influenced by Maharashtrian elements while Mandla region is more tribal in character with reservations for jhuming cultivation and has sparse population. Balaghat (18,999) and Mandla (19,416) are the two district headquarters and regional centres. Maikal Plateau with Amarkantak forms a radial drainage. It also forms the northern rim to the Chhattisgarh Basin and carries dense forest. Dindori is a small service and route-centre on the Narmada.

With steep descent, sometimes over 300 m, from the Vindhyan scarp is met with the *Narmada-Son trough*, drained in opposite directions from the Murwara Basin, and lying under the shadow of the Vindhyan. The three distinct regions are (i) the Narmada Trough, (ii) the Murwara Basin and (iii) the Son Trough.

The Narmada Trough: Jabalpur, the second largest town of Madhya Pradesh, gives it an air of development. Wheat, cotton and jowar are the main crops, all being rainfed. It is an alluvium-deposited trough. Granite topography in Madanmahal near Jabalpur is one of the best developed. The Trough, particularly south of the Narmada, is more densely peopled with roads and railways running parallel to the river which have led to the growth of a number of towns, notable among them is Narsinghpur (17,940) followed by Gadarwara (14,696), Sohagpur, etc.

Murwara Basin with Murwara (60,472), and

Khamaria, Kymore (12,319), Sihora (14,194) etc. appears to be somewhat more developed than the surrounding regions.

The Son Trough, in contrast to the Narmada Trough, is narrower over most parts, fault-guided and less accessible. West of the Gopad confluence the river appears to have shifted southward from the northern scarp leaving a belt of alluvial tract and is somewhat more populated. Sidhi (5,021) is now the district headquarters in this part. Between the confluences of the Gopad and the Kanhar with the Son, the trough is still narrower excepting in the lower Ghaggar Basin below the Kaimur scarp. Chopan, a bridge-head settlement, is emerging as the important service centre here.

Problems and Prospects

From the foregoing analysis of the physical and cultural features, there remains little doubt that the Vindhyan-Chal-Baghelkhand is emerging as a significant region in Central India with the tentacles of administration of three states, M. P., U. P. and Bihar. The main problem of development, therefore, hinges on the degree of coordination and integration of policies formulated by the three States. In the national interest, for development purposes, the region need be administered by a common Development Board. The next problem is associated with the general cultural lag of the region constituting as it does a vast tribal realm which is consequent upon its high inaccessibility. The human resource is qualitatively poor and its improvement is of vital significance for the general development. Though development of road transport during recent years has been able to make a mark on the regional landscape, yet extra efforts have to be made to link the sub-regional centres among themselves and the region by national highways reviving the great Deccan Road in full swing from north to south and extending NH 12 eastward to Ranchi via Ambikapur. Lastly, the core of the region with integrated mining-cum-industrial development, based on the local resources, will become the growth-pole for Central India tending to influence the economy of the Middle Ganga Plain as well.

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Chotanagpur marks the north-eastern projection of the Indian peninsula, being one of the major components of the eastern plateaus. There appears to be a great deal of confusion, however, regarding its precise boundaries and areal coverage. The physiographic map of the National Atlas depicts it as the plateau portion of Bihar combined with the eastern margin of Madhya Pradesh. The monograph on Economic Regionalization of India, published by the census of India, while treating Chotanagpur as a natural region being an integral component of the north-eastern plateaus shows the western boundary coinciding with the Bihar-Madhya Pradesh boundary but groups it together with the northern hills of Orissa in the south.¹ Although the northern edge of the plateau abutting against the South Bihar plain (Magadh-Anga Plain) with bold scarps for the greater extent is distinct enough, some geographers exclude the Rajmahal hills and highlands of Santhal Parganas from Chotanagpur. In the words of E. Ahmed, "the country south of the 500' contour line is the hill and plateau region of Bihar. All this tract except the Kaimur plateau in Shahabad and Santhal parganas is known as the Chotanagpur plateau".² The exclusion of Santhal parganas presumably because it is included in the Bhagalpur division and not in Chotanagpur division of Bihar is not justified by the nature of habitat, economy and society which are more akin to the plateau region rather than to the plain region of Bihar. According to S. P. Chatterjee, "Chotanagpur plateau covers the districts of Santhal parganas including the Rajmahal hills in the north, the Ranchi and Singhbhum in the south and the Palamau in the west" beyond the Damodar valley covering the Hazaribagh and Dhanbad districts.

Conventionally, Chotanagpur is limited within the bounds of Bihar as before the reorganisation of states which resulted in the merger of parts of former Manbhum, now Purulia district, in West Bengal on grounds of predominance of Bengali population, although there is no sharp change in the nature of terrain either across the Bihar-M. P. boundary traversing through the *pats* (high level



Fig. 17.1

laterite plateaus) or across the Orissa-Bihar boundary which cuts indifferently across the drainage lines. Chotanagpur, thus delimited, exhibits relatively greater uniformity of terrain in the form of predominantly plateau topography at different elevations as against the mass of confused hills alternating with enclosed river basins in Baghelkhand or the Garhjat hills of Orissa. It represents not merely a physiographic entity but also a politically recognised cultural unit inhabited originally by aboriginal tribes but experiencing rapid transformation of the cultural landscape during the present century through the influx of people from

the adjoining plains lured by its immense mineral wealth and industrial opportunities.

The region, thus delimited, has very irregular boundaries on all sides; the extreme points lying between 22°0'-25°30' N latitudes and 83°47'-87°50' E longitudes covering an area of 86,239 km² and comprising the districts of Ranchi, Hazaribagh, Singhbhum, Dhanbad, Palamau and Santhal parganas of Bihar and Purulia district of West Bengal (Fig. 17.1).

Historical Background

The Chotanagpur plateau was a virtual "no man's land" and the refuge of the ethnological sweepings of the plain³ until the 18th century owing mainly to its rugged and dense forest-clad terrain. It is stated that during the reign of Ashoka the *Atavi* or forest states too acknowledged Magadh supremacy, and this may justify the conclusion that Chotanagpur was included in the Mauryan empire at least during his reign. His invasion of *Kalinga* in Orissa further testifies to this. This region has been, nevertheless, avoided by the rulers of the plain. The invasion thrusts of the Moghuls, the Marathas and the British which have been very significant factors in the early history of modern India, avoided Chotanagpur and the adjoining hilly areas. All the inter-regional movements before the advent of railways were directed east-west through the plains.⁴ The entire area lying between Rohtas in the west, Panchet hill in the east, and Ratanpur in Central India extending upto the borders of Orissa in the south was known as *Jharkhand* or jungle land during the Moghul period. Chotanagpur was also known as *Kokrah* during the Moghul period and was loosely annexed to Moghul empire, its chief attraction being some diamond mines. There were small princely states such as those of Ramgarh, Kharagdiha, Kendy, etc., with very local influence within the region, before the British period. In 1765, Shah Alam II granted *Dirani* to the East India Company authorising it to claim the tribute of such small states.⁵ The hold of the Company was only nominal. The first effective measure to integrate this hilly inaccessible tract to the South Bihar plain was taken

in 1772, when Capt. Camac invaded the region.⁶ In the succeeding period, roads linking Patna to Deosai (headquarters of Chotanagpur) through Gaya-Chatra, and Hilsa-Muckundganj (Hazaribagh)-Ramgarh-Chutia (Ranchi), were constructed to exercise effective control over the region. Subsequently, the area was systematically surveyed which brought to light the vast deposits of coal, iron ore, and other minerals. The extension of railways prompted by the desire to exploit these minerals brought further economic and administrative integration with the Bihar and Bengal plains.

The Physical Setting

Geology

Chotanagpur is composed mainly of Archaean granite and gneiss rocks with patches of Dharwar rocks (phyllite, mica-schists etc.) on the northern and southern margins, the latter being very conspicuous in the iron ore and Kolhan series covering greater part of the Singhbhum district. The Dalma range marks the belt of Archaean lava flows. "The structural base of the region is provided by a series of batholithic intrusions of granite into Dharwar strata, which were intensely metamorphosed by orogenetic movements. The earliest floor, on which the Dharwars were deposited, has not been recognized anywhere since it was subsequently metamorphosed".⁷ This part of Chotanagpur is characterised by complex geological structure. There is evidence of a peneplained "ancient fold mountains, extending east-west across north Singhbhum and south Ranchi and into north Dhalbhum and south Manbhum.... Jamshedpur lies on the central axis of this pre-existing range; the hills stretching east and west of Dalma are on the site of the northern slopes of that old mountain system. The great shear or thrust zone runs approximately ENE-WSW and E-W for nearly 100 miles turning to the S E near the eastern end.... There are two almost parallel thrust zones to the north of the great shear zone, one marking the northern limit of a broad belt of lavas (Dalma Traps) and the other further north. They are almost parallel to the Satpura trend and converge near Goalkera, east of Chakradharpur."

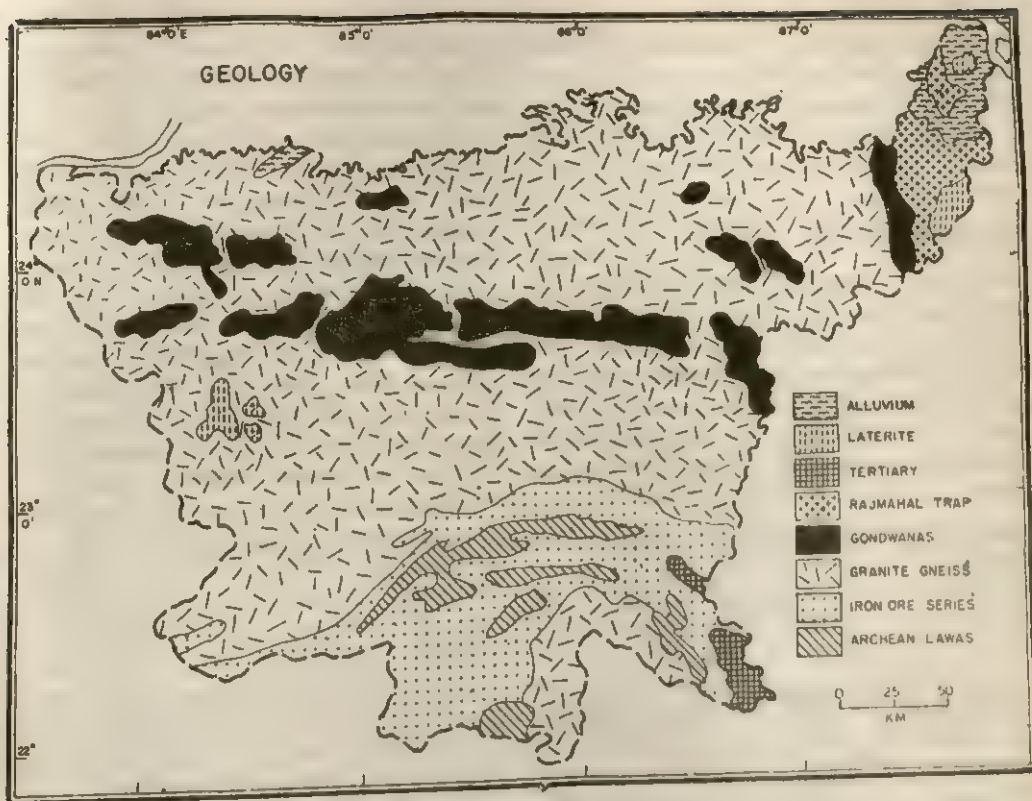


Fig. 17.2

In the structural trough of the Damodar valley occur Gondwana rocks consisting of sandstone of great thickness with some slates and clay. The Pat land on the western margin is covered with Deccan trap which is converted into laterite and bauxite due to weathering. The Rajmahal hills in the north-eastern fringe of the plateau are also covered with lava flows which were probably linked with the initiation of the Himalayan orogeny. Rajmahal Traps (Fig. 17.2) consist of dolerites, basalt and andesites. These structural units are helpful in reconstructing the geological history of Chotanagpur which has been succinctly summarised by Dunn as follows:

"A long period of erosion evening out the irregularities of gneissic and granitic pre-Cambrian land surface; an ice age in the Upper Carboniferous; major trough faulting in the Permian times that brought into being the Damodar valley when the Gondwana rocks were laid down in fresh water

lakes; uplift in the hot desertic conditions of Triassic days when some five thousand feet of unprotected Gondwana sediments were stripped away and massive sandstones of Mahadeva series (Middle Gondwana) were formed; a volcanic outburst in the Jurassic; and minor faulting and tearing during Tertiary earth movements". Of greater importance for understanding the existing geomorphology in the incessant erosion from Cretaceous period accentuated by uplifts during the Tertiary era in the following succession:

(i) An early Tertiary peneplain was uplifted by 300 m to the south with a tilt to the north-east;
 (ii) A further uplift of perhaps 300 m sometime between Middle and Late Tertiary;

(iii) After an interval sufficient to permit the formation of quite a well defined peneplain, a further uplift of above 100 m took place with at least a sharp upwarp in the Subarnarekha plain.

Towards the southern edge of Chotanagpur the upward movements were cumulative whereas further north, close to the edge of the Ganga alluvium and particularly around Rajmahal hills, there was no apparent differential movement—there may have been subsidence but certainly not uplift.

Relief and Drainage

Chotanagpur virtually consists of a series of plateaus standing at different levels of elevation (Fig. 17.3); the highest general elevation of about 1,100 m being in the mid-western portion known as the *Pat* lands. From here, the land descends in all directions in a series of steps particularly towards the east until it merges gradually with the Lower Ganga plain. The sharp

breaks in the slope are marked by steep scarps where the river courses are interrupted by waterfalls. The most characteristic features of relief are revealed in the Hazaribagh and Ranchi plateaus standing at the same general elevation (600 m) but separated by the Damodar trough. To the west of the central Ranchi plateau rise the *Pat* or high level mesas capped with laterites facing the former with bold steep scarps while to the east the land drops abruptly with similar scarps on to the Manbhum plain. The Baghmundi highland tract attaining a height of above 600 m at places is separated from the Ranchi plateau by the Subarnarekha river. To the south-east there is similar abrupt drop on to the Chaibasa plain but towards the south it gradually turns into a lower dissected upland characterised by

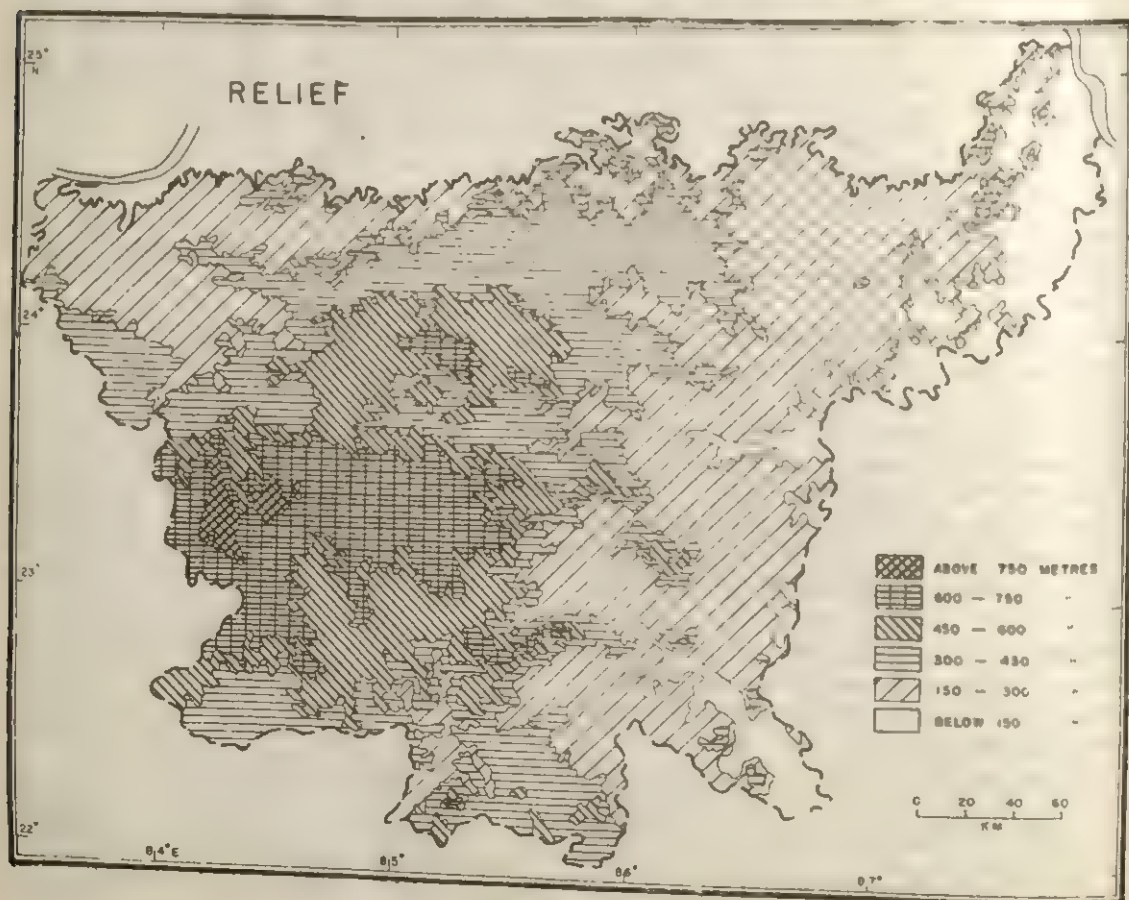


Fig. 17.3

diverse complex topography of the Kolhan and Porhat regions. The varying successive levels from *Pat* lands to Chaibasa plain mark the successive uplifts of an old peneplain during Tertiary era. There has been some difference of opinion regarding the number of uplifts as well as the character and connections of different peneplains.⁹ While S. P. Chatterjee¹⁰ has suggested the occurrence of four peneplains on the central Ranchi plateau, others¹¹ do not subscribe to this view. Following Dunn, most of the writers regard the plateaus as the products of three successive uplifts of the same peneplain. The highest plateau, i. e. the *Pat* region was uplifted above the pre-existing peneplain in early Tertiary times while the central Ranchi plateau together with the higher *Pats* was block-lifted towards the Late Tertiary period leaving the original peneplain marked by the Chaibasa and Panch-paragana plains at the original level. The third uplift was in the nature of a tilt so that there is no steep scarp on the outer edge of Chotanagpur. "All the three plateaus, upper, middle and lower, resemble each other in many respects, that is, they appear to be flat, extremely gullied, studded with low rounded hills and bordered by steep escarpments."¹² The Hazaribagh plateau, on the northern side of the Damodar trough has essentially the same features and elevation. It also has two distinct surfaces; the upper Hazaribagh plateau at 600 m stands engirdled by the lower Kodarma plateau (300 m) which is bordered by steep scarps in the north but slopes gradually to the east. Westwards, in Palamau, this plateau exhibits highly broken relief similar to the southern dissected portion of the Ranchi plateau. On the north-eastern side, the plateau continues into the Rajmahal highlands comprising a chain of level lava plateaus, sculptured hills interrupted with valleys and undulating divided surface.¹³ The volcanic Rajmahal hills extend north-south rising 300-450 m above the general plateau surface overlooking the Ganga in the north with steep scarps to the west. The Damodar valley lying in between the two main plateau blocks occupies the Permo-Triassic trough fault and exhibits a variety of topography characterized by sandstone hills e. g. Panchet and Mahudi, rising

above undulating plateau platforms at various elevations, such as the Ramgarh peneplain, and steep sided scarps on both sides of the Damodar and scarp edge interfluves between pairs of rivers.¹⁴

Chotanagpur is drained in different directions by numerous rivers and streams of which the South Koel, the North Koel, the Subarnarekha, the Damodar and the Barakar rivers have developed extensive drainage basins (Fig. 17.4) while the Ajai, the Mor, the Brahmani, the Gumani etc. drain the Rajmahal highlands in parallel channels towards the West Bengal plain. The northern fringe of the plateau is drained by numerous small tributaries of the Punpun, the Phalgu, the Sakri and the Kiul rivers towards the South Bihar plain.

The rivers are characterized by wide shallow channels over the flat plateaus but exhibit youthful characteristics marked by steep-sided, narrow valleys or gorges, the courses being interrupted by rapids and waterfalls. A series of big or small waterfalls are marked at all the scarp fronts : Gautamghagh (36 m), Ghaghri (42m), Burhaghagh (40 m), Sadnighagh (60 m) in the *Pats*; Høndru (73 m), Johna, Dasam (39 m), Hirni, etc. on the eastern margin of the central Ranchi plateau; Motijhara (45 m) in Rajmahal hills; and Kakolat (24 m) on the northern edge of the Hazaribagh plateau.

The river regime is highly fluctuating, with continuous flow only during the monsoon season and either completely dry bed or disconnected pools of water during the rest of the year. The rivers rise suddenly after the monsoon downpour but after a few hours they quickly subside to fordable level.

Owing to their traverse mostly on the peneplain surfaces the over-all drainage pattern is dendritic signifying limited structural control even though they flow over rocks of varying character and hardness. However, there are several local variations, depicting different types of drainage patterns. Some of the fault-guided rivers, e.g. the Damodar, have remarkable straight courses. A variety of the trellis pattern is seen in the Damodar valley where a series of parallel faults

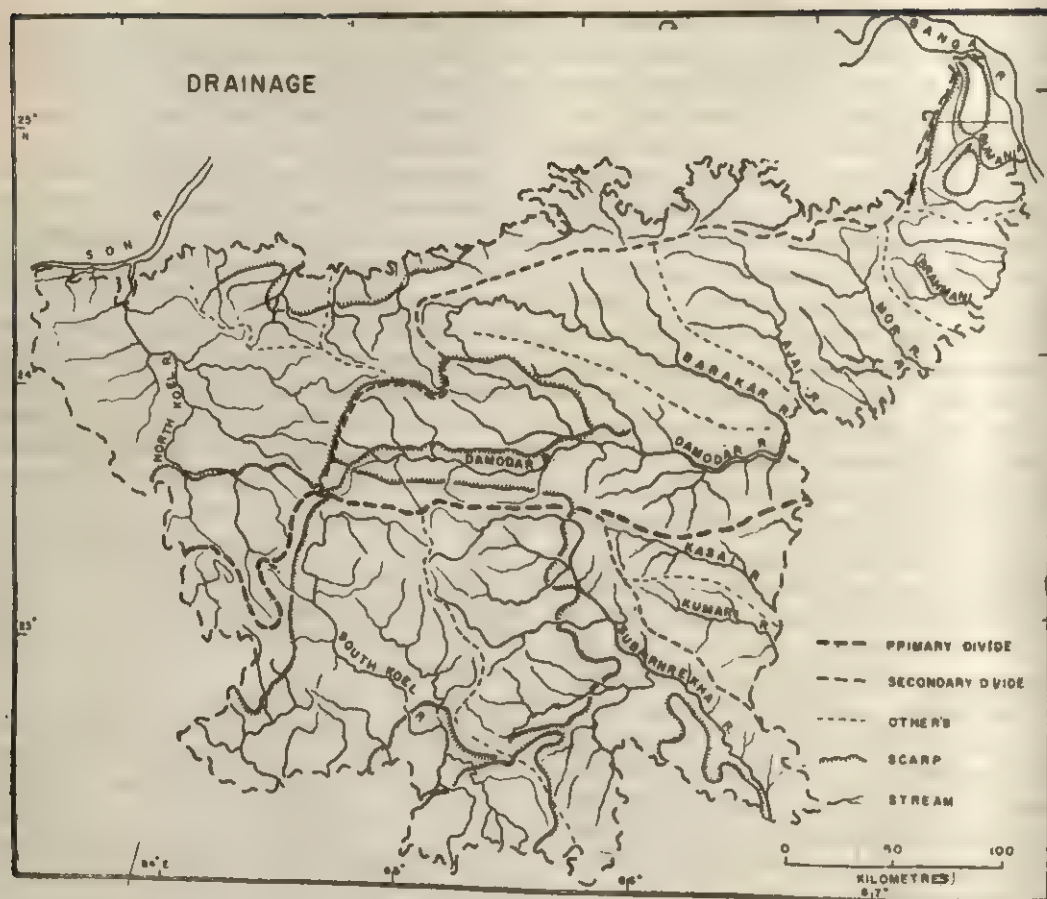


Fig. 17.4

have resulted in alternating bands of strong and weak rocks which give the drainage a 'fault trellis' pattern. Trellis pattern is also visible in the folded structures of Chotanagpur where alternating weak and strong rocks have been truncated by stream erosion. The Sankh reveals a barbed drainage pattern where its tributaries join it in "boathook bends" pointing upstream. In north Palamau 'angulate' pattern has developed under the influence of joints in the granite-gneiss areas. Radial pattern can be marked over the plateau tops in Patr, the central Ranchi plateau, and the Hazaribagh plateau.

There are marked differences in the drainage density of different basins. The Subarnarekha basin has the highest density with 65-95 km of

drainage per 250 km² in the greater part of the basin. It rises at places from 95-130 km per 250 km². Next comes the South Koel basin with almost equal density. The North Koel, Damodar and Barakar basins have 35-65 km with patches of 65-95 km per 250 km². In Rajmahal Highlands the drainage density is comparatively low.

Climate

Chotanagpur experiences the characteristic monsoon climate having a seasonal rhythm running through all the elements of weather. With the commencement of the hot weather in March the temperature rises sharply until May, the monthly mean ranging between 29°C-32°C, creating a low pressure area in the north-eastern part of the

plateau. The wind, consequently blows from west with increasing velocity from 9.6 to 14.4 km/hour.¹⁸ By the end of May calms become more frequent and the westerly winds begin to cease and the seasonal low pressure establishes in the north-western India. There is some precipitation in April under the influence of the Nor-wester of West Bengal.

During the season of rains (June-October) the temperature begins to decrease with the onset of the south-western monsoon. The seasonal trough of low pressure which lies in the Ganga plain in July, shifts to the south, over the plateau, in August-September. The winds generally blow from east and south-east. The wind velocity decreases gradually with the advance of the season. Heavy rainfall, accounting for over 80% of the annual rain, is the most characteristic feature of this season. The average annual (1901-50) amount of rain ranges between 100 to above 150 cm. It is liable to fluctuation, however, from year to year. For example, Ranchi, Hazaribagh and Dhanbad had 163, 164 and 184 cm of rain in 1959 against their normal amounts of 151, 134 and 131 cm respectively. The general distributional pattern shows that the amount of normal rainfall decreases from south to north and east to west. There are significant local variations, nevertheless, according to topographic features. The higher localities have comparatively greater amount of rain. The highest amount occurs at Netarhat (over 1,000 m) located in Pats; while the Chaibasa plain lying on the south eastern fringe having below 300 m elevation, has much lower rainfall.

The cold weather season commences from November and lasts till the end of February. The normal January temperature at Hazaribagh and Ranchi are 16.4°C and 17.3°C respectively. There extends a wedge of high pressure from the north-west with gentle gradient. The wind blows, therefore, from north-west with low velocity (4—6 km/hr.). The occasional invasion of the north-western disturbances bring a little rain.

There is some distinction in the climate of Chotanagpur from that of the neighbouring plains. Even though the plateau has a tropical

location, the climate is relatively cooler owing to higher elevation. During the rainy season the weather is not as muggy because the air on the high plateau is rarely still. The only period of relative discomfort, particularly at lower levels, is from mid-April to mid-May when the temperature is almost as high as in the plains.

Natural Vegetation

Although much of the original vegetal cover has been depleted by reckless cutting and grazing, some pockets of valuable forests still lie intact in the inaccessible parts of Chotanagpur. There are three types of forests found over the plateau:

(i) Dry deciduous forest is found on the fringes of the Hazaribagh plateau where the annual rainfall is below 125 cm. It comprises a wide variety of stunted deciduous trees like *Amaltas*, *Semal*, *Harra*, *Khair*, *Palas*, *Mahua*, *Asan* etc. mixed with bamboo and sabai or *Kus* grass. Such forests generally occur in river valleys amidst dissected terrain. The flat plateau surface is generally covered with grass.

(ii) Dry Peninsular *sal* is extensively found over the Hazaribagh plateau, the lower Palamau and the Pat lands and occurs in scattered patches over Ranchi plateau and in Singhbhum district. *Sal* is found mixed with bamboo and catechu especially in the north-western part.

(iii) Moist Peninsular *Sal*: This forest cover is located in Singhbhum where valuable timber is available from the stands of *sal* and other species, notably *Mahu*, *Kusum*, *Asan*, *Piar*, *Khair*, *Gamhar*, *Anjan*, *Karanj* etc. Sabai grass and bamboo are also found in these forests.

Teak has a limited distribution in the Singhbhum valley (Saranda and Kolhan region).

Soil

The soils of Chotanagpur vary according to the nature of parent rocks. The plateau is covered with the characteristic red soil of the gneiss and granite surface with the exceptions of (a) loose sandy soil developed over the Gondwana sandstones in the Damodar valley, (b) the high level lateritic soil over the Pats, and (c) *regur* and lateritic soil over the lava surface of the Rajmahal highlands.

The soil over the gneissic and granitic surface is deep red or even black in colour because of the presence of highly ferruginous biotite and hornblende. This soil has sufficient potash and lime but nitrogen, phosphoric acid and humus contents are inadequate. It is generally thin, sandy or gravelly on the uplands but thick and loamy in valleys and depressions. The *regur* of the Rajmahal highlands is basaltic containing siliceous matter, kaoline and potash as well as magnesia and iron oxides. The black clay developed over it is sticky when wet and retains moisture for a long time but becomes hard though friable when dry. It is very fertile. The lateritic soil of the Pat and certain localities in Singhbhum is infertile. The depth and fertility of the different soils are highly variable according to the details of topography and rock constituents.

Minerals

Chotanagpur has the most important mineral belts of India accounting for 40 to about 100 percent of the national production of various minerals. In certain minerals it holds a key position: it produces nearly 100% of India's copper and apatite (till recently), 95% of kyanite, more than 50% of coal, mica, bauxite and china clay and about 40% of iron ore. Chotanagpur Plateau contains 80% of India's known deposits of coal and nearly 100% of coking coal also.

The above mentioned important minerals occur in well defined belts (Fig. 17.5). The occurrence of coal coincides with the Gondwana rocks of the Damodar valley. The principal coalfields extend in east-west direction conforming approximately to the alignment of the Auranga and Damodar rivers from the Hutar fields in the

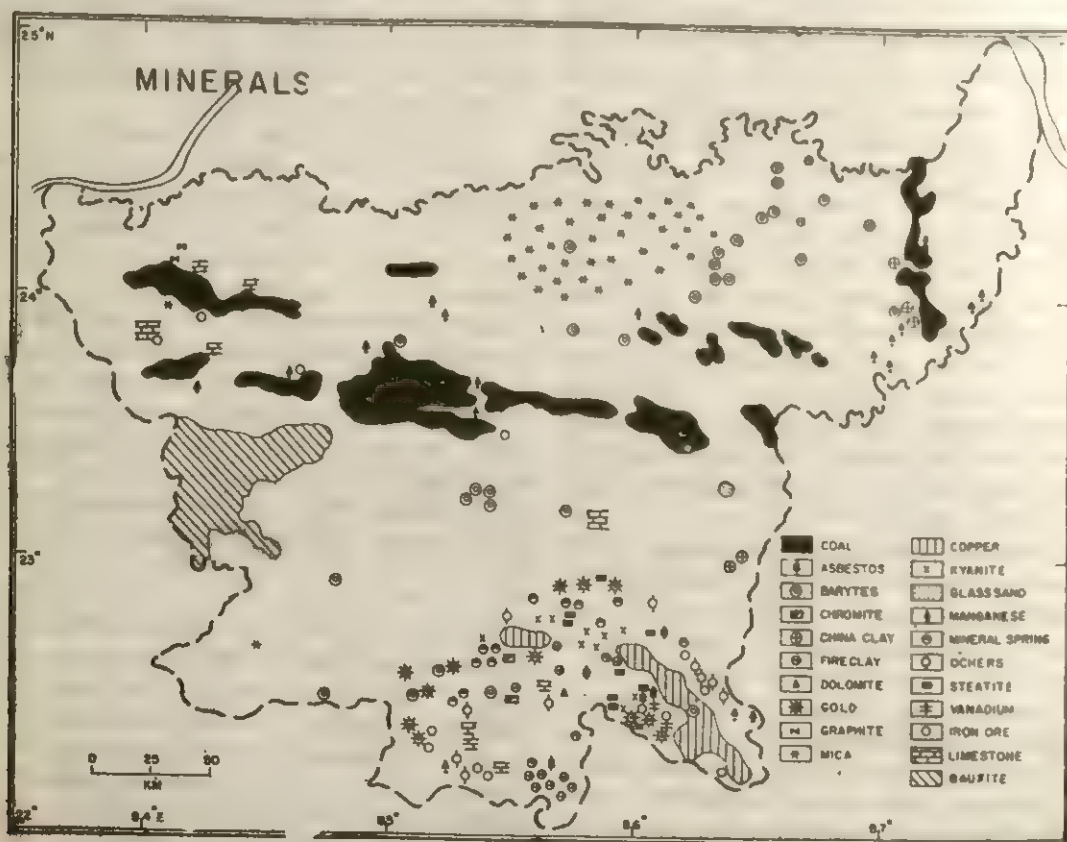


Fig. 17.5

west to Jharia fields in the east. There are other fields, off this main strike, such as the Daltonganj and Giridih fields. Most of these fields contain good quality bituminous coal suitable for coke. The estimated and inferred reserves total 45,841 million tons or approximately 38% of the total coal reserves of the country. The production from these fields in 1960 was about 25 million tons i.e. nearly 50% of the India's total production. The anticipated production in 1970 is 64.20 million tons accounting for 35.5% of India's total. Thus, although the production of coal fields in Chotanagpur has been constantly increasing, its relative share in the country is declining because of the increasing exploitation of inferior grade coal in other States.

Iron ore is associated with the Iron Ore Series of the Dharwars in the Kolhan area of Singhbhum district. It crops out in two narrow horse-shoe-like parallel ridges, which have open sides in Singhbhum. The ridge forming the western side of the horse-shoe is known as the Iron Ore Range. The iron occurring here is haematite having more than 60% iron content. Jones has estimated that a minimum of 1,047 million tons of ore averaging not less than 60% iron content crops out within Kolhan area in Singhbhum¹⁶. The production in 1960 was 2.79 million tons out of 10.45 million tons for India. The anticipated production in 1970 is 6.14 million tons.

Limestone occurs scattered in considerable areas of Palamau, Hazaribagh, Ranchi and Singhbhum districts and feeds the various cement factories located nearby.

Mica is found in a belt, 128 km long and 32 km wide in the northern fringe of the Kodarma Plateau. This belt roughly coincides with the outcrop of Dharwars consisting of schists, gneiss and pegmatites.¹⁷ The annual production is highly fluctuating. It was 121,545 cwt in 1951, and declined continuously to 73,047 cwt in 1954; again rose gradually to 114,358 cwt in 1957 but declined sharply to 20,021 in 1958 and then gradually to 13,835 cwt in 1962.

Copper veins occur in a 130 km long belt in Singhbhum following the line of soda granite outcrop. Commencing from Duarpuram near

Chakradharpur, it runs through Kharsawan up to Turandih; thence, although the soda granite outcrops are missing for some distance, the copper belt persists through Rakha mines, Musabani and eventually ends at Bahargora¹⁸. Its production in 1962 was 492,255 tons. It is mined at Rakha mines and processed at Man Bhandar.

Bauxite occurs in the Pat area. The bauxite enrichment in the laterite cappings on the west side of Ranchi district and adjoining highlands in Palamau district constitutes, at present, the most important deposits in India. The reserves of high grade amount to more than 10 million tons.¹⁹ The continuously rising annual production reached 218 thousand tons in 1962. It is mined near Lohardaga and railed to Muri for processing into alumina.

Apart from these, various other minerals like apatite, asbestos, byrites, chromite, kyanite, steatite, uranium etc. are found in Singhbhum. Uranium, the atomic mineral is mined at Jaduguda near Rakha mines.

Physical Resource Base

It is evident from the foregoing that Chotanagpur is endowed with a variety of natural resources which form as a composite whole a sound base for the development of a well integrated economy.

Although the plateau is not so rich in thick fertile soil as the adjoining plains of South Bihar and West Bengal, it has good pockets of rich soil in valleys and depressions which respond well to irrigation and provide sustenance to the majority of rural population. There is considerable scope for expanding the land under cultivation as the percentage of culturable waste is quite high. The possibility of increasing the area under double cropping is limited because of limited irrigation facilities.

Forest is much more luxuriant and a valuable source of timber supply over extensive areas in the districts of Palamau, Ranchi, Hazaribagh and Singhbhum. The Singhbhum valley has considerable reserves of good quality timber. Sal, teak, asan, karam, kath and gamhar are the main varieties of timber obtained. Bamboo, an

important raw material for paper pulp, is an important product of Palamau forests from where nearly 1.5 crores of bamboos are taken out every year from Govt. forests. *Sabai* grass used for manufacturing rope and paper is very common in Singhbhum from where about 3 thousand tons are taken out every year. The forests of Chotanagpur contribute nearly 41% of lac production in the country. In addition, these forests yield a number of minor products viz. *Tendu* leaves for *biri* making, *mahua* flowers and fruits, myrabolans, *kath*, etc.²⁰ In Chotanagpur, there is excellent combination of various minerals discussed above, with adequate power resources of the Damodar valley, providing unique opportunities for the development of diversified industrial base, particularly the ferrous and non-ferrous metallurgical industries. As indicated earlier, besides having enormous reserves of good quality coal, Damodar valley is the only source of coking coal in the country. Thermal power plants have been set up at Bokaro and Chandrapura and another power plant is coming up at Patratu. In addition, hydro-electricity is being generated in the valley with the completion of the Damodar Valley Project. The table below gives the power capacity and production of different stations :

TABLE 1

Power Stations	Total installed capacity in MW	Power generated in 1966-67 (million KWh)
<i>Thermal</i>		
Chandrapura	420	1,821.77
Bokaro	247	1,270.94
Patratu	250	—
<i>Hydro :</i>		
Maithon	60	65.78
Panchet Hill	40	51.39
Tilaiya	4	2.89

A number of power sub-stations are connected with transmission lines forming a grid, 1,276 km long (132—K V type), and 192 km long, (33—K V type). The 132-KV transmission line runs east-west from West Bengal through Burdwan, Durgapur,

Maithon, Chandrapura, Bokaro and Barhi and goes to Rihand in U.P. A number of transverse lines run from the main line of which Maithon-Panchet Hill, Patherdih-Sindri, Chandrapura-Purulia, Bokaro-Gola-Muri and Ramgarh-Khalari-Mandar-Kuru-Johardaga are worth a mention. The major consumers of D.V.C. power are the Tata Iron and Steel Co., Indian Iron and Steel Co., Chittaranjan Locomotives, Indian Copper Corporation, Ghatshila and the Eastern and Southeastern railways for their electric traction. This close proximity of abundant power with the occurrence of iron ore, limestone, copper, bauxite and a variety of other minerals does not obtain in any other region of India.

The Cultural Setting

Population

The total population of Chotanagpur is 12,964,405 (1961), distributed very unevenly (Fig. 17.6) reflecting the habitability condition, an expression primarily of terrain features and the historical process of population-spread. There is overall sparse population (about 150 per km²) in comparison to the adjoining South Bihar Plain (385 per km²) or Bihar as a whole (approx. 400 per km²), with sharp regional and local variations in the distribution following similar differences in the nature of topography. The hilly and highly rugged areas such as the Pat lands, the broken country of Palamau and western Hazaribagh, the northern dissected fringe of Kodarma plateau, the Rajmahal Hills and the southern dissected upland have very sparse population. There are thick clusters in wider valleys while steep scarps and hill slopes are practically uninhabited. Comparatively level portions of Hazaribagh and Ranchi Plateaus, Rajmahal Highlands and Singhbhum Plain have, relatively speaking, evenly distributed population. A patch of thick population concentration, comparable in density to the middle Ganga Plain, occurs in the rolling upland of the lower portion of the Damodar valley where a great influx of population has taken place during this century.

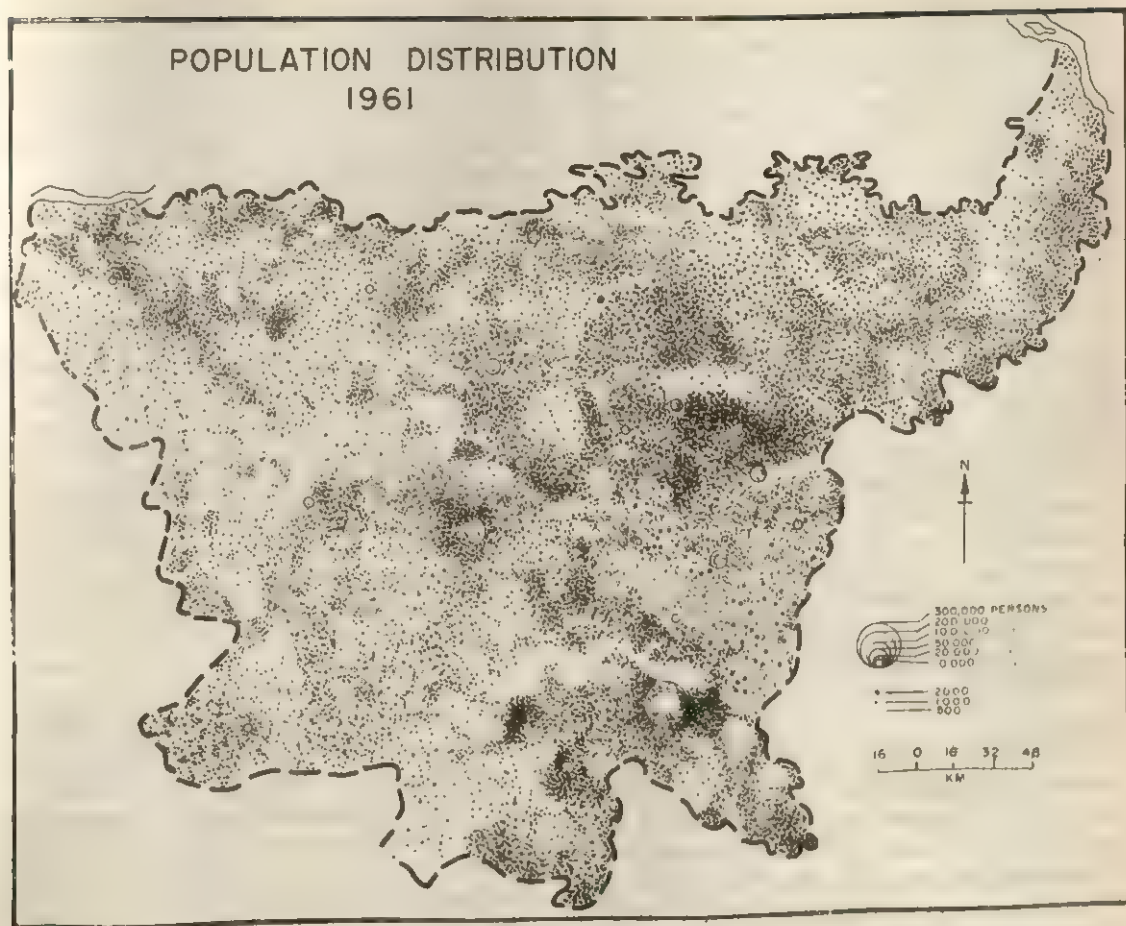


Fig. 17.6

The density of population in different regions is related to the supporting capacity of land, a function of the existing level of resource utilization. The average density is about 150/km² excepting the more populated coal mining areas in Dhanbad district. The barren lands with scattered patches of cultivated land such as the *Pat* lands and similar pockets of dissected terrain have less than 40/km². The forest-clad areas viz., the rugged portions of the Hazaribagh, Ranchi and Rajmahal Highlands have a density of 40-100 persons/km². Forest areas are largely negative in respect of population for several reasons like inaccessibility, restrictions for settlement in reserved and protected forests, poor water supply, insecurity from wild animals, etc. The level peneplains carry a population of

100-200/km² because of suitability for cultivation. Several handicaps, e.g., over-drainage, lack of irrigation facilities and varying thickness of the soil cover restrict the fertility of the soil necessitating great effort to eke out a poor subsistence. In the most favourable localities, where mining or manufacturing offer better opportunities, population density increases to 200-400 per km². Such conditions obtain in the lower portion of the Damodar valley, north-central Singhbhum and in small patches around mining or industrial nodes like Ranchi, Ramgarh, Hazaribagh, Giridih etc. The mining-industrial Dhanbad region has the highest density rising to 400-600 persons per km² which is comparable to the density in South Bihar or adjoining West Bengal Plain.

Trends of Growth : The population in Chotanagpur has been steadily increasing since 1921. In 1911-21 decade there was general decrease of population except in Palamau, Dhanbad and Singhbhum districts. Thereafter, in 1921-51 period, every district has shown decennial increase ranging from 3.92% in Santhal Parganas to 21.97% in Dhanbad during 1941-51. In the decade 1951-61 every district has experienced highest-ever decennial rate of growth ranging from 15.21% in Santhal Parganas to 27.91% in Dhanbad. Compared to the average rate of growth for Bihar (19.78%), Santhal Parganas (15.21%) and Ranchi (15.86%) have lower rates while the remaining districts have higher rates. In general, the districts lying in Chotanagpur have experienced much higher growth rate in comparison to the plain districts of Bihar. This is because the plateau districts have large number of immigrants attracted by the increasing mining and industrial activities. The most conspicuous growth has been experienced in Dhanbad (27.91%), Hazaribagh (23.70), Palamau (20.49) and Singhbhum (20.54) districts.

Mobility of Population : Chotanagpur has been attracting immigrants from other areas of Bihar since 1921. Greatest net immigration has been witnessed by Dhanbad (part of former Manbhum). The net migration in this district was 87, 88 and 134 thousands respectively in 1921, 1931 and 1951. In other districts of the plateau, the net immigration almost equalled net emigration in the said decades. "In Manbhum (Dhanbad) the attraction lies in the coalfields and the industries which developed, based upon coal; the attraction of Singhbhum is explained by the iron mining and rapidly growing city of Jamshedpur with its Tata Steel Works. The immigration to Palamau is the result of the colonization in this rather thinly populated district."²¹ During 1961, Dhanbad and Singhbhum districts continued to attract the greatest number of immigrants followed by Hazaribagh. Palamau had the least number of immigrants. The most notable feature, however, is that the immigrants in these districts from outside the State far out-number the inter-district migrants. In Singhbhum, greatest number of

migrants come from West Bengal, Orissa, Uttar Pradesh, other States and foreign countries. In Dhanbad, the greatest number is from Hazaribagh and Gaya districts but the number from other districts is far less than that of neighbouring States particularly West Bengal and Uttar Pradesh.

Future Trends : In the light of the past trends of population growth and migration pattern the future trend may be projected. According to E. Ahmed, the population at the turn of the century may be expected to increase by 150% over 1951 population. The increase may be even higher if the urban growth around new industrial centres and improvement in the general economic conditions are taken into consideration. The high decennial increase during 1951-61 in almost all districts is a clear evidence of higher growth rate in future. However, on the basis of a minimum of 150% increase, the density of population in different districts at the turn of the century will be as follows :

TABLE 2

District	Density (per km ²) 1961	Density (per km ²) 2001
Santhal Parganas	180	235
Palamau	90	145
Hazaribagh	130	210
Ranchi	115	175
Dhanbad	400	1,230
Singhbhum	150	310
Furulia	217	550

Population Structure : In Chotanagpur the average sex-ratio is 960 but in Dhanbad it is much less (789) as a substantial proportion of immigrants come to work here in coal mines leaving their families behind at native places. The sex ratio has been fairly stable. There has been little variation between 1951-61 excepting in Dhanbad where the ratio decreased from 819 to 789.

The percentage of literacy in Chotanagpur is on the whole, lower than the average in India (23.7%). It varies from 13.39% in Palamau to 25.46% in Dhanbad. Dhanbad is the only district having higher percentage of literacy than

national average. The percentage of literacy among females is much lower than that of males ranging from 4% in Palamau to 10.0% in Dhanbad against the national average of 13.7%, whereas the literacy among males is higher than the national average (33.9%) in Dhanbad (37.81%) and Singhbhum (33.9%). It has increased from 3 to 9 per cent in different districts during 1951-61.

The majority of population in Chotanagpur is rural including considerable tribal population in the different parts. The percentage of tribal population to total rural population is 12.6% in Hazaribagh, 14.8 in Dhanbad, 20.2 in Palamau, 40.5 in Santhal Paraganas, 60.25 in Singhbhum and 68.0 in Ranchi. There are some 25 different tribes having their own respective dialects and distinctive ways of life; notable among these are *Munda*, *Oraon*, *Ho*, *Kharia*, *Birhor*, *Pahariya*, *Santhal* and *Asur*. *Santhals* and *Pahariya* live in Santhal Paraganas; *Asurs* inhabit the hilly regions of Ranchi and Palamau; and *Kharia* and *Birhor* roam as nomads in Singhbhum and Ranchi districts. Other tribes live in the plateau areas of Ranchi and Hazaribagh. *Santhali*, *Munda*, *Oraon*, *Ho*, and *Kharia* are the five principal dialects of the tribals.

The percentage of urban population (1961) in Chotanagpur ranges from 0.3 in Santhal Parganas to 25.0 in Dhanbad as against Indian average of 17.8. Singhbhum also has high ratio of urban population (21.5%). Ranchi (9.5%) and Hazaribagh (8.4) have higher percentage of urban population than the average of Bihar (8.4). Palamau has only 4.7% of population living in urban areas.

Agriculture is the predominant occupation of the people, the percentage of working population engaged in agriculture being 70.5 in Singhbhum, 77.0 in Hazaribagh, 82.5 in Santhal Parganas, 83 in Purulia, 83.5 in Palamau, and 84.3 in Ranchi. Only in Dhanbad district it comes down to 45.7 wherein 21.5% of the working population is engaged in mining and another 6% in manufacturing. The highest percentage engaged in manufacturing (8.25) is found in Singhbhum. In the remaining districts it is insignificant (less than 2%).

Rural Settlements : It is clear from the above

analysis that the majority of people in Chotanagpur live in scattered villages. The density of villages per 100 km² varies from 22 in Ranchi to 74 in Santhal Paraganas reflecting the density of population modified by the size of the villages. In general, the villages in Chotanagpur are of small size having less than 500 persons. The percentage of such small villages ranges between 63 (Dhanbad) and 89 (Santhal Paraganas). Excepting Dhanbad and Ranchi, the small villages are above 75% everywhere. Large villages having more than 2,000 inhabitants are, in contrast, highest in number in Dhanbad accounting for 11% of the total number and least in Palamau (only 1%). Thus, the districts having highest number of small villages have the highest density of villages and vice-versa.

TABLE 3
Rural Settlements

District	Density of villages per 100 km ²	Size of villages		
		Villages with population below 500	500-2,000	2,000-4,000
Santhal-paraganas	74	8,975 (89)*	1,056	34
Palamau	26	2,488 (77.5)	679	26
Hazaribagh	35	4,950 (75)	1,117	86
Ranchi	22	2,503 (65)	1,289	64
Singhbhum	34	3,488 (78)	920	29
Dhanbad	52	925 (63)	464	62

* Figures in bracket indicate percent of total number of villages.

The rural settlements in Chotanagpur Plateau are, generally speaking, of dispersed type. "The dissection of surface into scarps, ridges, plateaus, basins, and valleys, irregular distribution of alluvium, the general poverty of soil, seasonal regime of streams, need of terracing for agriculture and interference of forests result in the relative dispersal of settlements." There are significant regional variations, however, in the type of settlements. Compact settlements are noticeable in the lower Damodar valley i. e. Dhanbad dis-

trict and Chaibasa Plain.' On the relatively level Hazaribagh and Ranchi Plateaus also there are compact or semi-compact rural settlements. In the Santhalparganas dispersed linear settlements are the characteristic feature. In Palamau, semi-sprinkled or hamleted settlements are found. North Koel Basin has compact settlements. Over the plateau, the typical settlement is neither wholly compact nor perfectly dispersed. It consists of a number of hamlets, a central village and several dispersed dwellings. But even in the central village and the outlying hamlets there is nothing like the congestion seen in the rural settlements of the Bihar Plain where the dwellings are closely huddled together with narrow or no lanes. Over the plateau, even in clusters and hamlets the dwellings are relatively apart or dispersed. The rather spacious enclosures attached to the dwellings and wide inter-house spaces present a picture strikingly different from that of the compact settlements in the plain.

The typical rural house consists of a central room surrounded by an enclosed verandah giving a double-storey appearance set amidst a large multipurpose enclosure serving as open courtyard, kitchen garden, threshing ground etc. The walls are built of mud and the roof is tiled but in the forested areas and Singhbhum plain thatched roofs become common.

Urban Settlements

There are 70 urban centres in Chotanagpur according to 1961 census. Jamshedpur and Ranchi are the only two cities having a population of 3.28 and 1.2 lakhs respectively. Dhanbad (57,000) is the only second class town. There are 14 towns having population of 20-50 thousand, 20 between 10-20 thousand, 28 in 5-10 thousand group and 5 towns have less than 5,000 persons.

Almost all the towns in Chotanagpur originated and grew up during the modern period. A great number of them owe their origin and growth to mining and industrial activities consequent upon the appearance of railways. 25 towns have grown up on the coalfields in Dhanbad district where Dhanbad-Jharia-Sindri group is growing into a conurbation. Noamundi, Ghatsila, Manbhandar

and Mosabani have grown up in the iron and copper belt in Singhbhum while Jhumri Tilaya and Giridih are the most important urban centres of the mica belt. Jamshedpur, the second biggest city in Bihar owes its origin and growth to the Tata Iron and Steel Works.

Some towns have sprung up along the contact zones of different peneplains just below the scarps as break-of-bulk centres. Ramgarh, Ichak, Bundu, Kharwan and Chakradharpur lie at the junction of 300-600 m erosion surfaces while Lohardaga and Gumla are located at the borders of Ranchi plateau just below the *Pats*.

Other towns are located over the level peneplains at the convergence points of roads and function as administrative centres to which commercial and industrial functions have gradually been added. Ranchi, Hazaribagh, Daltonganj, Chaibasa, Purulia and Dumka are the examples of district headquarters towns.

In future, there is likelihood of most spectacular growth of towns in Chotanagpur as is evident from recent trends. The highest percentage increase in urban population during 1951-61 in Bihar has been recorded in the plateau towns. Among the cities of Bihar, Jamshedpur registered the highest percentage increase (52.24), followed by Ranchi (30.5), while Dhanbad was outstanding among second class towns with 68.66% increase. Out of the total of 36 towns added in 1961, 16 are located in Dhanbad, 6 in Ranchi, 3 in Santhal paraganas and 2 each in Hazaribagh, Singhbhum and Palamau districts.

Urban Morphology : "The towns of Chotanagpur are roughly similar in plan. They are generally straggling settlements built along roads and large compact sectors are uncommon. This is the result of local topography which is undulating consisting of micro-divides and intervening lowlands. The urban settlements are built along the narrow divides which also carry the roads. In the intervening lowlands in the centre of which occurs the rivulet or stream, rural enclaves exist and abut on the core of urban settlements. All towns are characterized by a convergence of roads following micro-divides and the resulting town plan is straggling, radial or star-like with fre-

quent absence of large congested clusters of built area". The urban centres are generally multifunctional engaged in miscellaneous functions, viz., administration, education, etc. Commercial population makes up roughly 1/5 of the total population. The percentage of agricultural workers is still very significant in most of the towns. Industrial function is also universally present accounting, in general, for about ten percent of total population. These functions are not quite well segregated spatially in most of the towns which extend in ribbon form along a road. In bigger towns having radial plans the convergence point of several roads is the most important location for most of such functions as retail trade, administration, education, etc. Ranchi typically exemplifies most of the above morphological characteristics of towns.

Ranchi : Located at the convergence point of roads coming from Hazaribagh, Daltonganj, Chaibasa and Muri on the comparatively level Ranchi peneplain, it is a typical highway-oriented city depending primarily on road transport for both external and internal relations until 1961 when a broad gauge line replaced the narrow gauge railway. The regional along with other local roads viz. the Kanke road, the Moharbad road, the Booty road, the Circular road etc., make up the main frame of the road plan in which many other short roads are interlocked. Ranchi hill near the site of the old commissioner's compound is the focal point from where all the main streets radiate. The street plan is fundamentally axial.²²

The internal structure of the city is closely associated with this road pattern. The city has developed mainly along the Chaibasa road. The hub of the town lies at the meeting point of four main streets i.e., the Chaibasa road, the Hazaribagh road, the Jail road, and the Kanke road. The main retail business is located southwards along the Chaibasa road and in two tentacles along the Hazaribagh and the Church roads. The wholesale market is located along the main road in the northern part, known as the Upper Bazar and in the Ranchi Hat which had a central position in the early days when the main concentration of the town was around the Ranchi Hill. The resi-

dential areas are aligned along various roads. Administrative offices are clustered into two localities. (i) Doranda and Hinoo in the south having A.G. office, Survey of India office, Chief Inspector of factories office, Forest office etc., and (ii) in the northern part where court, municipal office, Chief Engineer's Office, Commissioner's office etc. form a second administrative nucleus. The religious and educational institutions, banks, hospitals etc., are located at the focal point of roads in the centre of the city and along the Church road. The new educational institutions have preferred peripheral locations to avoid congestion : Agriculture and Engineering Colleges, School of Music and a few others on the Bariatu road and the university near the Morabadi hill. The industrial complex around Heavy Machine Plant at Hatia (outside municipal limit) with its rows of Labour colonies has added a new dimension to the urban landscape of Ranchi.

Jamshedpur is a typical industrial city with more than 70 percent of population engaged in industrial function. The morphology of the city is, therefore, greatly influenced by the industrial function occupying the central position with its hub at TISCO (Fig. 17.7). The road pattern is the outcome of four successive plans. The initial plan was prepared by J. Kennedy which gave the city a rectangular pattern on the lines of the U.S. cities. Sakchi Boulevard was constructed as the main thoroughfare starting from Tatanagar station and terminating at Beldih. Bistupur and L-town situated beside this road have a perfectly rectangular form. F.C. Temple (1920) avoided the straight geometrical pattern and taking the nature of terrain into consideration designed the roads in such a way that great rise and fall is avoided. His outer and inner circle roads follow uniform heights. Koenigsberger's plan (1943) introduced the neighbourhood unit concept dividing the city into 12 zones and disfavoured the construction of continuous houses. Widely separate colonies were set up, each being a self-sufficient unit in respect of essential amenities and services.²³

The functional morphology of Jamshedpur is simple. The industrial hub is surrounded by

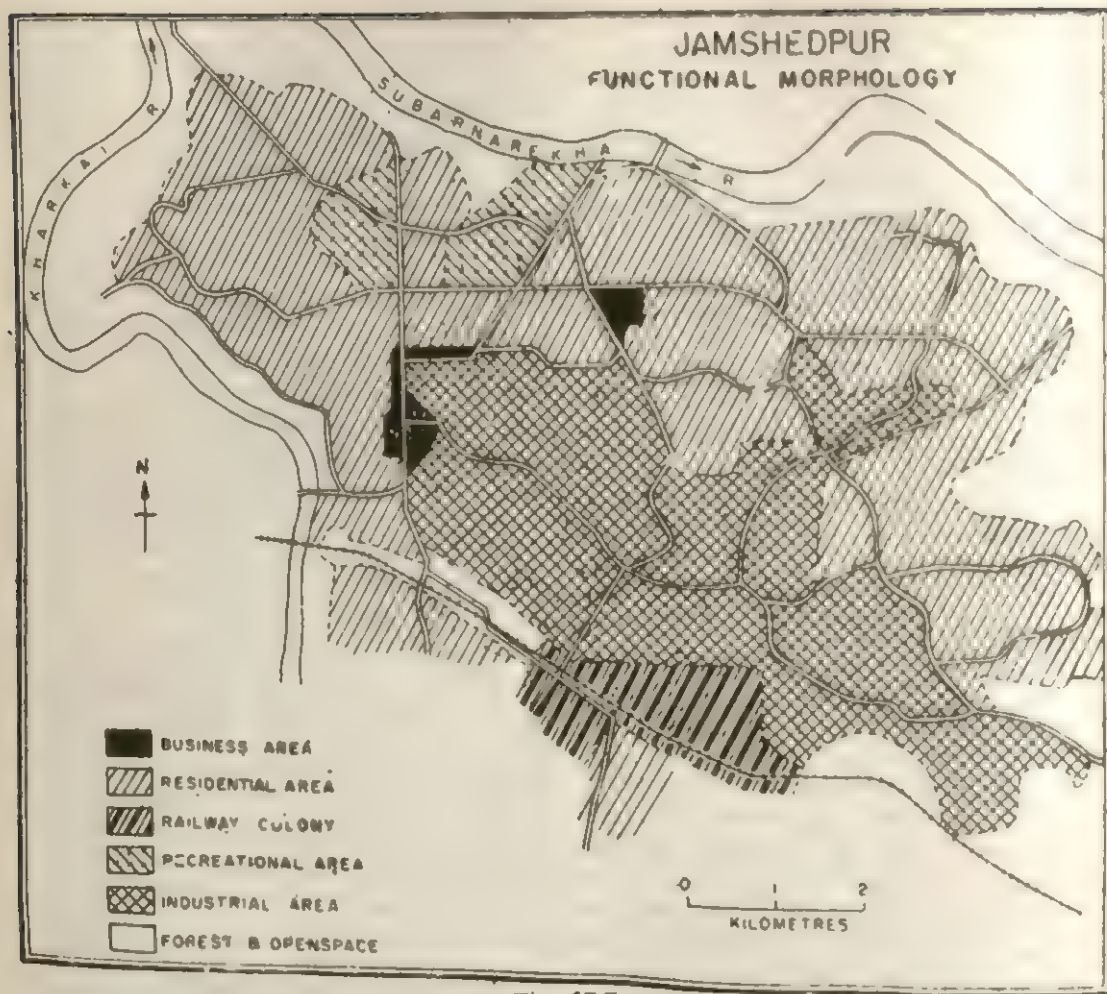


Fig. 17.7

residential areas on the three sides by the colonies built on neighbourhood pattern and on the fourth by the railway colony with its own typical features. On the outer fringes are to be found the parks, playgrounds, open spaces and eventually forest along the banks of the two bounding rivers; the Subarnarekha and the Kharkai. It is apparent that administrative function has little impact on the morphology of the city because it is not even a district headquarters. Similarly commercial function is also subservient to the industrial function. The wholesale business is confined to the south of the Tatanagar Station.

Dhanbad : The morphology of Dhanbad reflects the impact of mining and administrative

functions. Dhanbad, located on the edge of the Jharia coalfields, owes its origin and growth to the increasing exploitation of the coal fields. It was made a railway station in 1895 to handle the export of coal and by 1907 it became a busy railway junction. Municipality was formed in 1919. The Indian School of Mines was established in 1926 to train the personnel for mines. In 1956 it became the headquarters of the district after the creation of separate Dhanbad district out of former Manbhum.

Three urban zones may be easily distinguished in Dhanbad. The main Bazar lying to the south of the railway line forms the inner zone characterized by housing congestion and predomi-

nantly commercial function. The middle zone includes the Nayabazar, the railway colony and the civil lines having more open spaces being mainly residential and administrative zone. The outer zone is most spacious and residential-educational in functional character. Towards the south, along the Dhanbad-Jharla road, there is ribbon development of town bordering on coal-science of the two towns.

Economy

Land Use : Forests occupy considerable portion of land in different districts varying between 25% to 50% except in Dhanbad (only 15%). The highest percentage of land under forest cover lies in Palamau (50) followed by Hazaribagh (48.2), Singhbhum (47), Ranchi (25) and Santhal Paraganas (23.75). The net area sown varies between 1/5 to about 2/5 of the total area in different districts. The percentage of net area sown is highest in Ranchi (37.8) and lowest in Hazaribagh (20.6), Santhal Parganas (37), Dhanbad (33), Singhbhum (25.5) and Palamau (24.4) stand at intermediate level in this respect. The percentage of net area sown is intimately related to the degree of flat land available in different districts. The areas affected by gully erosion or covered by steep slopes are either covered by forests or fall under the category of culturable waste. The cultivated lands are confined either to flat plateaus at different elevations or to valley bottoms where terracing is feasible. The percentage of culturable waste is quite high all over Chotanagpur, being closely comparable to the net area sown. It is 16.8 in Singhbhum, 18.4 in Palamau, 20.35 in Hazaribagh, 24.4 in Dhanbad, 26.8 in Ranchi and 30.00 in Santhal Paraganas. Because of limited irrigation facilities, thin soil cover, over-drainage, and vagaries of monsoon, substantial portion of the uplands covered by thin forests is left as poor grazing or fallow land. The land not available for cultivation does not show much regional variations.

Agriculture provides the mainstay for 70-85% of working population. The cropping pattern in Chotanagpur discloses the over-dominance of coarse rice of early variety.

Kharif crop which is devoted almost entirely to rice dominates in every district but it overshadows *Bhadai* crops and reduces *Rabi* crops to insignificance in Dhanbad and Singhbhum, where the cultivated land is flat and the rainfall is heavy ensuring good rice crop. In Santhal Paraganas, Hazaribagh and Ranchi, *Bhadai* crops consisting chiefly of maize take significant share of the cultivated land although it is far behind Kharif. This is so because the cultivated land in these districts is divided between uplands and low lands or valley bottoms; the former is less fertile owing to thin soil cover, soil erosion and less moisture-retaining capacity and thus suitable for quick growing maize, while the latter having thick deposited soil and terraced fields is devoted mainly to rice cultivation. Palamau, having infertile soil except in valley bottoms and less rainfall has almost equal share of Kharif, *Bhadai* and *Rabi* crops mainly because of the uncertainty of rain resulting in frequent failures of *Bhadai* and Kharif crops. The average yield of rice per acre decreasing from east to west speaks of the relative advantage for this crop in different districts. It is 0.39, 0.37 and 0.28 ton per acre in Santhal Parganas, Dhanbad and Singhbhum respectively. In Hazaribagh, Ranchi and Palamau the yield comes down to 0.20, 0.21 and 0.22 ton respectively. In terms of total production however, rice outweighs every other crop in all the districts of Chotanagpur showing that the region has virtually a monoculture and the different other crops entering into the crop combination contribute but little to the total out-turn of crops.

Agriculture in Chotanagpur depends entirely on the monsoon. With its onset starts the broadcasting of maize on the uplands, especially the land adjacent to the homesteads and paddy in the lowlands. After the harvesting of these crops the land is generally left fallow. In addition to rice and maize, ragi, gram and vegetables are also grown. Ragi is grown in Hazaribagh and Ranchi, gram in Palamau and Santhal Paraganas and vegetables in Dhanbad and Ranchi districts. The products of different crops, particularly rice, are characterised by great annual fluctuations according to the vagaries of the monsoon. The mon-

soon rain is highly variable and the variability is maximum in the months in which consistency is most desired. Greatest value is attached to the departing rains in October which are most likely to fail. Alongside cultivation, livestock-raising and poultry farming are generally carried on in Chotanagpur as a subsidiary source of income. The cattle reared are of poor quality for they depend on natural pastures on the open grazing grounds and suffer greatly from the paucity of forage. The agriculture being of extensive nature, the yield is not sufficient to meet the food requirements of the growing population. All the districts are deficient in almost all food grains necessitating imports of food grains from the South Bihar plain where rice, coarse grains, potatoes, chillies and other vegetables are grown in surplus in different localities.

Industrial Economy : Chotanagpur has the most advantageous situation for the development of sound industrial economy owing to the abundance of forest and mineral raw materials. The availability of good quality iron ore, coking coal, and limestone provides excellent advantages for the growth of the cycle of ferrous metal industries. Bauxite and copper ore in association with the hydroelectricity of the Damodar Valley provide bases for the non-ferrous metal industries. Bamboo, *Sabai* grass timber, lac and other minor forest produce can support paper, furniture, plywood, matchworks and a host of other forest-based industries. Large scale cement, chemical, glass and refractory industries may develop on the basis of limestones, quartz sands and coal and coke available in the region in abundance. Besides, agro-based and consumer goods industries may develop in the fast growing urban centres on the imported agricultural raw materials from the adjoining plains. The high density of population in the adjoining plains of Bihar, Uttar Pradesh and West Bengal are sources of cheap labour and provide markets for agricultural implements, fertilizers and consumer goods. A good network of broad-gauge double-track electrified or dieselised railways with main lines providing direct links to Calcutta, Delhi and Bombay and the branches extending directly to mineral raw

material sources, are most advantageous to the industrial plants. A good road network complements the rail net-work in providing easy accessibility to different urban centres in the region. Moreover, the State government also holds out "a package of incentives" for facilitating the establishment of large and medium scale industries. These incentives include facilities of licensing, procurement of land in industrial complexes, viz. Adityapur (Jamshedpur), Patratu, Ranchi and Bokaro, provision of building materials for quick constructions, financial assistance, preference of manufactured products in store purchases, assistance in preparing project reports, exemption of sales tax for 5-10 years in purchasing raw materials, subsidies for housing schemes and cheap water and electricity supplies from Government sources.

In spite of the availability of a wide variety of raw materials and the attraction of a number of favourable factors, the industrial development of Chotanagpur is limited. The large and medium scale industries are clustered as yet around a few nuclei which have developed some semblance of industrial complexes (Fig. 17.8). Jamshedpur, Hatia (Ranchi), Dhanbad-Sindri-Bokaro, and Patratu are such nuclei. At Jamshedpur, the TISCO, which manufactures a wide variety of iron and steel products, forms the hub around which a number of other factories manufacturing tin plate, electric cables and wires, locomotives, railway rolling stock, automobiles, paper machinery, agricultural implements, earth moving machinery, heavy chemicals and refractories, etc. have grown up. There is a copper factory at Manbhandar. The Heavy Engineering Corporation at Ranchi manufactures metallurgical machinery, machine tools and iron-steel castings, electrical equipment and motor's ball, roller and tapered bearings, grinding wheels and abrasives, agricultural implements, and drugs-pharmaceuticals also. Cotton textiles, alcohol, and ceramic industries also have grown in and around Ranchi. In Dhanbad district fertilizers, chemicals and portland cement are manufactured at Sindri. Fire bricks and refractories are found on both sides of the main railway line between Dhanbad and Barakar. In addition, a number of metallurgical,

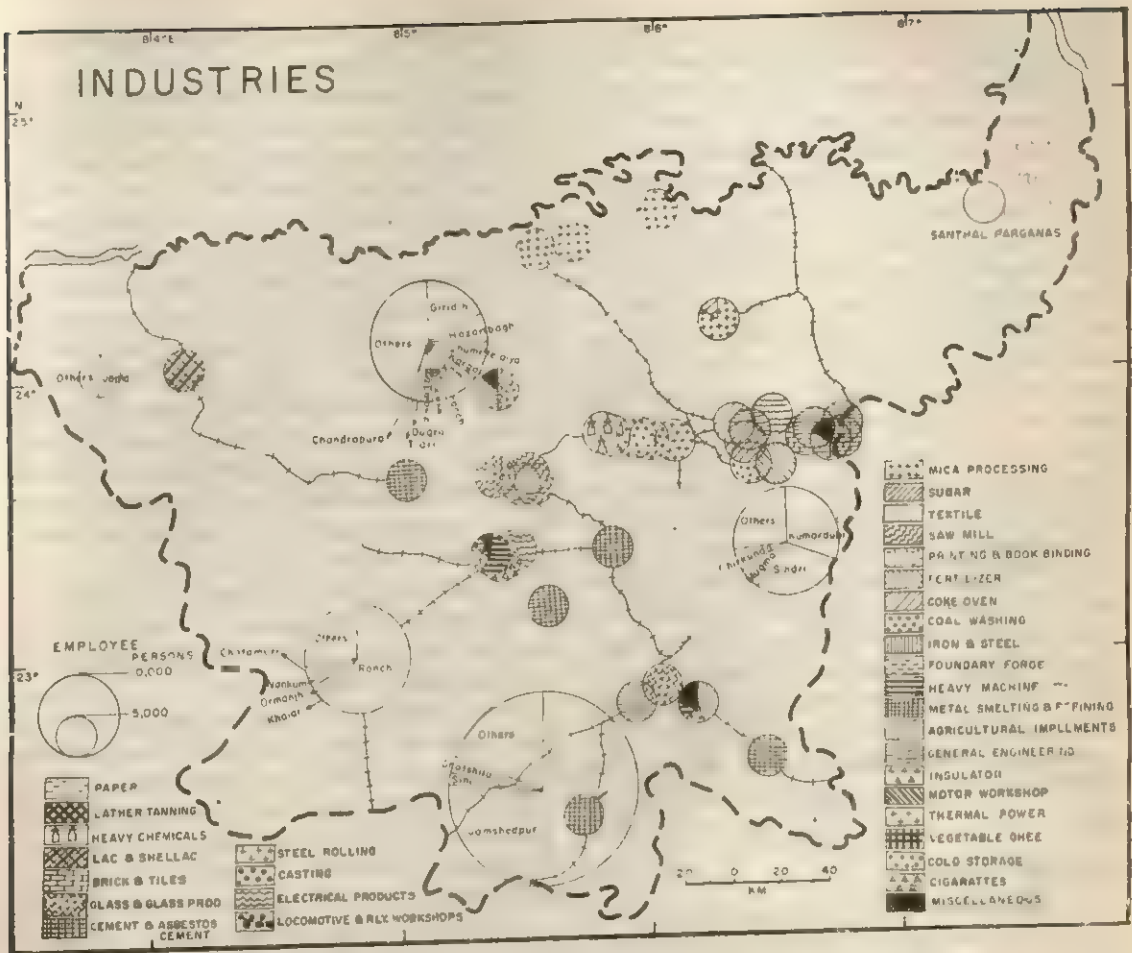


Fig. 17.8

electrical and telecommunication equipment, industrial machinery, glass and food processing industries are located in Dhanbad-Jharia town group. Several important factories are found straggling along the Barkakana loop; glass factories at Ramgarh and Bhurkunda cement factory at Khalari, and chemicals at Gumia. Cement factories are found scattered at Jhinkapani, Khalari and Japla.

There are numerous small scale industries manufacturing mainly consumer goods and are located usually in important nodal centres. Such industries are found at Ranchi, Hazaribagh, Giridih, Jhumri Tilaiya, Chaibasa, Jamshedpur, Jharia, Dhanbad, Katras, Kusunda, Chirkunda,

Daltonganj, Hariharganj, Garwa and Japla.

There is little variation in the nature of small scale industries. The largest number of such industries are concerned with the metal products followed by chemicals and chemical products. Food products, furniture and fixtures, non-metallic mineral products and electrical goods are other industries almost universally present in all the districts.

The industries in Chotanagpur are highly localized either around important nuclei of heavy and basic industries or in large urban centres. Industrial landscape appears only in Dhanbad district where a dense network of railways and road inter-link a number of large and small mining and

industrial towns owing mainly to coal mining. The industrial base is strong though still very small. Mining, industrial and transport activities account respectively for 21.5, 6.0 and 3.6 per cent of the total workers in Dhanbad district.

Tertiary activities occupy an insignificant place in the economy of Chotanagpur. The most noteworthy activity relates to services of different kinds. Commerce, transportation and construction follow in order. The importance of tertiary activities increases with increasing order of towns and cities. Chotanagpur has evidently great potentialities for developing a variety of heavy industries, particularly ferrous, non-ferrous, chemical, cement, paper and a host of other industries based on mineral, forest and agricultural raw materials utilizing abundant and cheap thermal and hydroelectric power. The industrial nuclei are likely to expand and form industrial complexes while the growing population and purchasing power in urban centres will encourage consumer goods industries on medium and small scale. The greatest handicap, at present, is the lack of capital and enterprise and much depends on government encouragement and financial assistance to small entrepreneurs and thus attracting outside investment.

Transport System

As pointed out earlier, the opening of Chotanagpur and its economic development owe entirely to the development of modern means of transport. The main line of the eastern railway was built in 1871, while the south-eastern main line and Raniganj-Jharia extension were opened between 1876-1900. The Grand Chord line connecting Dhanbad with Gaya traversing through the Hazaribagh plateau was completed in 1906. The Barkakana loop passing through the coalfields of the Damodar valley could be completed by 1929 because of its slow and gradual extension. The latest significant addition to the rail net has been the Chandrapura-Muri-Ranchi-Rourkela line which runs diagonally over the Ranchi plateau and was opened to traffic during 1960's. Concurrent with the development of railways designed primarily to exploit the vast coal, iron and other minerals,

there has been gradual development of roads for effective administration. The road frame of Chotanagpur consists of two important latitudinal roads viz. the Grand Trunk road running diagonally through Hazaribagh plateau; and the Garhwa-Daltonganj-Ranchi-Muri road passing through the Ranchi plateau; two longitudinal road viz. Aurangabad-Daltonganj and Nawada-Barhi-Ramgarh-Ranchi road, and several diagonal roads interconnecting them at various points and forming rectangular or pentagonal patterns. In Santhal paraganas a separate road system has developed where the Dumka-Sahibganj road forms the main axis from which short tentacles extend eastward. Similarly long tentacular roads taking off from the Daltonganj-Ranchi-Muri road extend to the south to interlink the towns of the Ranchi plateau and Chaibasa plain (Fig. 17.9).

The railway lines of Chotanagpur carry heavy traffic consisting of mineral and manufactured products and their importance in this respect is well reflected in their trackage. The trunk lines viz. the Grand Chord and the mainline of the South-Eastern railway are broad gauge, double track and electrified. The former serves as the primary artery for the flow of coal traffic in the country while the latter serves three steel plants : Jamshedpur, Rourkela and Bhilai. The Barkakana loop carries primarily coal while the Rajkhar-sawan-Gua and Tatanagar-Badampahar lines bring iron ore to the Jamshedpur steel plant. The Lohardaga, Ranchi-Muri narrow gauge line was built for carrying bauxite to Alumina factory at Muri.

The roads serve their primary purpose of providing interlinks among different towns. The Grand Trunk and the Patna-Ranchi roads are conspicuous for inter-regional freight as well passenger traffic. The roads in the Dhanbad district are busiest for passenger traffic; the Dhanbad-Jharia-Sindri road has more than 100 buses per day apart from innumerable taxis and other vehicles.

The Regions

The foregoing discussion of the spatial variations in different geographical elements in Chotanagpur clearly brings out that the heterogeneous

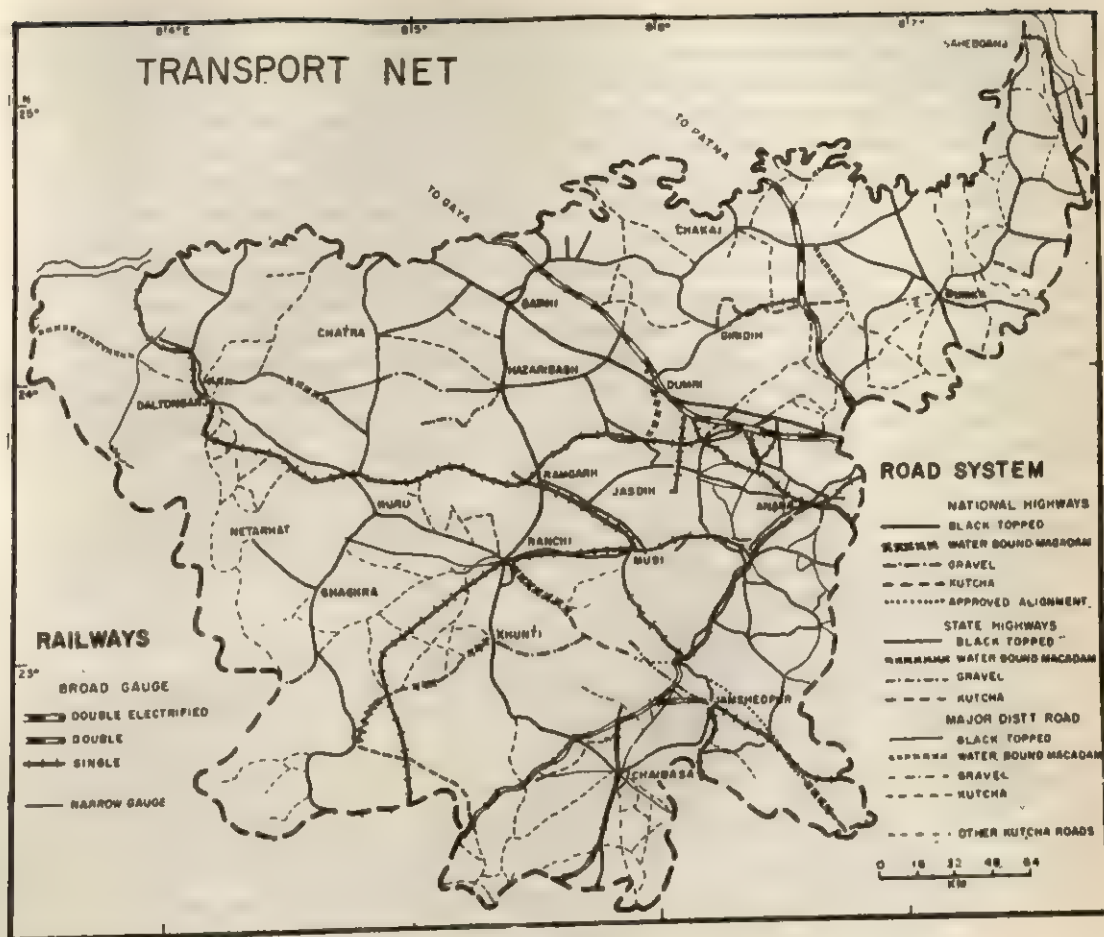


Fig. 17.9

relief, consisting of flat plateaus, steep scarps, tangled hills and entrenched valleys, is the most conspicuous feature of the region. As the basic climatic and hydrological conditions reveal little variation and man's cultural imprint conspicuous over the physical milieu only in restricted patches, there obtains remarkable accordance in the distribution of different geographical elements viz. geology, relief, soil, vegetation, natural resources, population, settlements, economic activities etc. It is easier, therefore, to outline the geographical regions of Chotanagpur because as the heterogeneity of terrain is resolved into units having uniform features there emerges a corresponding distinctiveness in the entire geographical per-

sonality. In the following scheme of regions, the higher order regions conform to the distinct physiographic units having broadly uniform topographic expressions and resource endowments while the lower order regions increasingly reflect distinct cultural features resulting from the varying degree of economic development.

The Chotanagpur North, for example, is distinguished from Chotanagpur South on the basis of relief; the former having relatively subdued though rugged topography and endowed with minerals like coal and mica and the latter having bold multicyclic relief, the different erosion surfaces being marked by series of scarps. The bold scarps of the *Pats* and Ranchi plateau mark the

dividing line between the North and the South. The second order regions are distinguished from each other by differences in the nature of economy besides variations in relief. Among the four sub-regions of the Chotanagpur North, the Damodar Valley is characterized by relatively level terrain and coal mining as well as industrial activity in addition to agriculture. The Hazaribagh Plateau has higher elevation, relatively level surface, forest, agricultural and mica mining activities in different parts; the Santhal Paraganas with relatively lower but level surface is inhabited by the Santhals having their characteristic cultural traits and economy and the Palamau upland is distinguished by its rugged terrain as well as poor agri-

cultural economy. Similarly, in Chotanagpur South, the Pat land rising above 1,000 m are largely forested; the Ranchi penecplain has subsistence agricultural economy; and the Singhbhum plain is distinguished by its undulating terrain and mining industrial activities besides the cultivation of rice; the nature of crops raised, kind of minerals exploited, and the level of economic development as reflected in development of manufacturing industries and urban centres, as will be evident in the subsequent text, delineate the characteristics of each region.

Thus, the Chotanagpur Region is divided into two first order, 7 second order and 22 third order regions as follows (Fig. 17.10) :

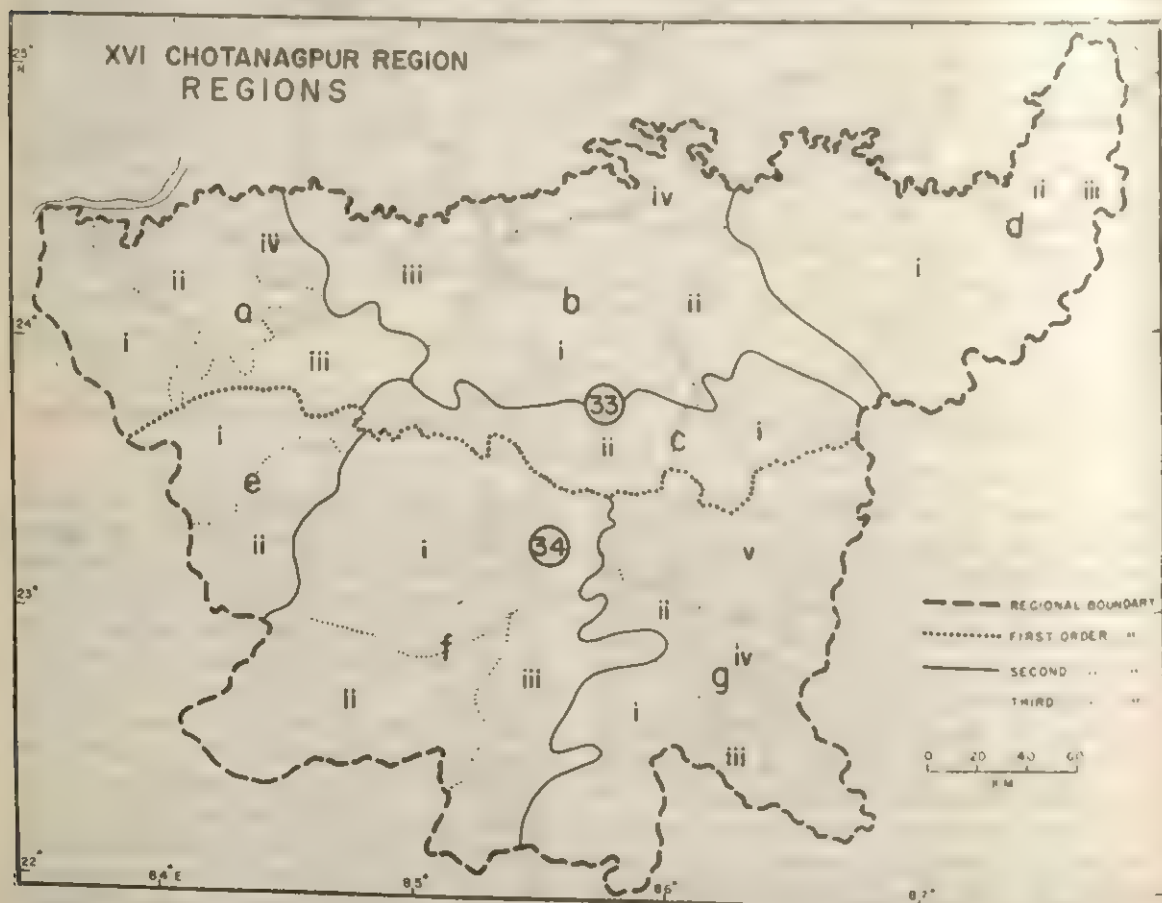


Fig. 17.10

The Regional Scheme

33. Chotanagpur North

- (a) Palamau Uplands
 - i) The Western Palamau Upland
 - ii) The North Koel Valley
 - iii) The Eastern Upland.
- (b) Hazaribagh Plateau
 - i) The Upper Hazaribagh Plateau
 - ii) The Lower Hazaribagh Plateau
 - iii) The Chatra Plateau
 - iv) The Northern Dissected Fringe
- (c) The Damodar Valley
 - i) The Dhanbad Region
 - ii) The Ramgarh-Patratu Region
- (d) Santhal Pargana Uplands
 - i) The Santhal Pargana Highland Region
 - ii) The Rajmahal Hill Region.
 - iii) The Marginal Plain Region.

34. Chotanagpur South

- (e) The Patland Region
 - i) The Ranchi Patland
 - ii) The Palamau Patland
- (f) The Ranchi Plateau
 - i) The Northern Ranchi Plateau
 - ii) The Southern Ranchi Plateau
 - iii) The Southern Hilly Region.
- (g) The South Eastern Chotanagpur or Singhbhum Region
 - i) The Chaibasa Plain
 - ii) The Subarnarekha Valley
 - iii) The Dhanjori Highlands
 - iv) The Dalma Range
 - v) The Purulia Upland.

The Hazaribagh Plateau : covers most of the Hazaribagh district and parts of the contiguous Gaya and Monghyr districts. It is a broad undulating plateau consisting of two distinct surfaces (i) the lower plateau at 300 m average elevation and (ii) the upper plateau having 600 m average elevation. The plateau receiving 100-125 cm annual rainfall is characterized by subsistence agriculture with coarse rice, maize and millets as the main crops grown during rainy season without irrigation and poor forest economy. The

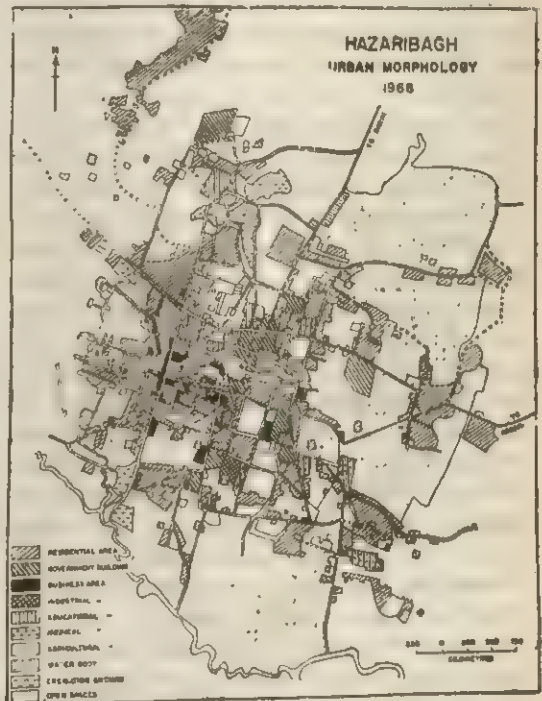


Fig. 17.11

Chotanagpur North

The northern Chotanagpur covers the areas lying to the north of the Patlands and Ranchi plateau marked by the bold scarps overlooking the Damodar and Auranga valleys. It is characterized by comparatively subdued relief with isolated hills and rugged plateau fringes. The land descends in all directions from the Upper Hazaribagh Plateau occupying a central position. It includes the following sub-regions:

deciduous type of forest has dry thorny scrub on uplands and scarps providing fuel wood, and moist dense forests in valleys and basins which are good source of timber. The density of population varies between 40-200 per km². The plateau is not developed industrially. The Grand Chord line and the Grand Trunk road run across this plateau. Hazaribagh (40,958 : 1961), situated beside the Ranchi-Patna road is the principal town having light consumer industries and serves as the commercial, educational and administrative centre

of the region (Fig. 17.11). This plateau may be divided into four sub-regions on the basis of differences in the nature of economy.

The *Upper Hazaribagh plateau* standing at a higher surface (600m) is marked by scarps on all sides; towards the south the bold scarps overlooking the Damodar valley have been cut at several places by the numerous tributaries of the Damodar forming deep forest-clad valleys. Cultivation and settlements are confined to tiny patches amidst thick forests except on the flat surface around Hazaribagh town where open fields are found. Rice is the main crop grown during the rainy season. Maize and other mixed crops are also grown.

The *Lower Hazaribagh plateau* lies to the north at the general elevation of 300 m and is drained by the Barakar towards the east. It has comparatively flat and even surface in the west but towards the east the surface is broken. "The lower surface today forms a broad undulating plateau drained by the Barakar river with terraced valleys and a skyline broken only here and there by isolated relict hills, such as the resistant granullitic mass of Parasnath rising to 4,480' and "other rising to much lesser heights and consisting mainly of Archaean quartzites and schists". The flat areas are devoted to cultivation of rice with *maua*, maize or other crops as subsidiaries. The villages are relatively compact and evenly distributed. Towards the south there is predominance of light forest and grazing. Gully erosion by the tributaries of the Barakar renders extensive areas unsuitable for cultivation and occupation. The villages are generally located on the divides and cultivated areas are found on the interfluvies. The roads also follow the divides. Giridih (36,881) and Jhumari Tilaiya (21,777) are two towns located in the eastern and western parts of the region respectively.

The *Chatra Plateau* in the west is drained by the numerous tributaries of the Lilajan flowing to the north and the Amanat to the west. It is characterized by highly undulating and dissected terrain covered with dense forest. The cultivated patches are tiny and scattered. Rice is the main crop. Maize, pulses and oil seeds are also

grown. Forests are good source of lac. Chatra (12,507) is the main town in the region.

The *Northern Dissected Fringe* has highly rugged terrain. "The steep forested scarps of the plateau and its outliers, the scrub forested gravel scree, the deep ravines and the sandy beds of the intermittent streams have interposed a barrier between the plateau and the alluvial plain"²⁴ of south Bihar. The average slope is 2°-4° rising to 6° at places. The drainage texture is very fine. The deeply cut valleys have dense forest. This is the region where mica is mined in valley bottoms. A few compact settlements e.g. Gawan, Tisri, Domchanch, Masnodih, Dhab, etc. have grown as mica-splitting centres.

The *Damodar Valley* : has varied relief comprising flat valleys, isolated hills, scarp fringes and miniature plateaus. Wherever the trough contains resistant rocks of Upper Gondwana, the relief rivals and sometimes exceeds that of the adjacent gneissic landscape. The hard sandstone mass of Panchet hill (630 m) rises to some 450 m above the surrounding country-side; in the Karanpura basin, Mahudi hill composed of resistant Mahadeva sandstone and conglomerates matches the height of Hazaribagh and Ranchi plateaus. The amount of rainfall is the same as that of the Hazaribagh plateau but the soil varies according to relief and parent rocks from clay and heavy loam in lowlands to coarser and lighter sandy soils on the uplands. Though rice is cultivated in entire valley lowlands, coal mining and associated industries constitute the most important activity, as the valley contains the best coalfields of the country. This has two distinct sub-regions:

The *Dhanbad Region* encompasses the Dhanbad district in the lower valley of the region. It is characterized by rolling topography sloping gradually towards the east. Industrial landscape is fast emerging here and the non-agricultural uses of land predominate. There is a dense network of roads and railways interconnecting towns clustered close together. An important feature of the distribution of towns in Dhanbad district is "the bunching together so that they verge on mutual coalescence". Three town groups are found in the region. The Dhanbad-Jharia-

Sindri group comprising seven other towns has a total population of 200,618. Kumardhubi town group consisting of four towns has a population of 43,000. The Katras town group has four towns with 30,000 people. Various mineral-based industries are located in these towns strung along the main railway lines. Coal mining and industrial activities are predominant.

The Ramgarh-Patratu Region covers the upper portion of the valley lying mostly in Hazaribagh district. This part of the valley has rice cultivation on the valley floor flanked by forests or rugged scarps and hillslopes. Coal mining in Karanpura fields is becoming increasingly important. Several industries have grown up along the Barkakana loop traversing the valley. Glass and cement manufacturing industries are worth mentioning. Patratu is growing as an industrial nucleus. Ramgarh (20,000) is the main town in this region.

Santhal Paragana Uplands : This region covers the Rajmahal highlands including the Rajmahal hills. The highland base has an average slope of 1° - 2° while the hills rising 300 m have 2° - 6° average slope. From the crest of the hills, numerous streams flow to the east and the west, the former having wide valleys e.g. Burhait valley. The soil is lateritic on the upper surface and humus-rich clayey in the valleys. The rainfall varies between 125-150 cm. The valleys turn out rich rice crops with natural rain supplemented by tank irrigation. Maize, gram and pulses are other crops. There is luxuriant forest cover on the uplands with sal as the predominating species. Wood cutting, cattle rearing, poultry keeping and vegetable growing are the side occupations of the Santhal tribes inhabiting this region. The population is sparse but the fertile valleys have 200-400 persons per km². The region is ill-served by transportation lines. Two main roads run along the western and eastern foot hills of the Rajmahal hills. Dumka (18,720) is the main town. This region is divided into three sub-regions:

The Santhal Paragana Highland region is characterized by undulating terrain and subsistence cultivation. Towards the west, land is comparatively level. Deoghar (30,813) is the principal town with cultural significance.

The Rajmahal hill region is mostly devoid of population because of rocky surfaces, steep slopes and poor lateritic soils.

The Marginal Plains receive debris from the numerous tributaries descending down the hills and thus have fertile soil. Rice is the main crop in these plains. Population is very dense.

Palamau Uplands : The Hazaribagh plateau turns into dissected Palamau Uplands towards the west. This region is characterized by varied relief, poor soils, scrub forests and poor agriculture. It is divided into three sub-regions:

The Western Palamau Upland is a tabular land with gently rolling relief. Average slope is $2-4^{\circ}$ and drainage texture is coarse. The cultivation is of subsistence type. Gram and other such crops are grown. It is generally an inaccessible area having few roads and railways. Recently the region is linked by Chunar-Churk-Garhwa Road Railway. The villages are mostly compact and widely spaced. Garhwa (11,656) is the main town in this region and is an important collecting centre for forest produce.

The North Koel Valley lying in the middle of Palamau Uplands is comparatively level with $1-2^{\circ}$ average slope. This valley is broader in the south near Daltonganj having only $1/2-1^{\circ}$ average slope but towards the north it is interspersed with hillocks that once formed a chain connecting the eastern dissected part with western upland. The rainfall increases from 100 cm in the north to 125 cm in the south. Cultivation is confined to level valley floor where rice, sugarcane and groundnuts are grown in moist fertile sandy-loam soil without any irrigation. The density of population is comparatively high. Rural settlements are compact and evenly distributed. Coal is mined from Daltonganj coal-fields. The Barkakana loop closely following the north Koel river, links it with the Damodar valley in the east and South Ganga in the north Plain. Daltonganj (25,270), the district headquarters of Palamau, is the main town.

The Eastern Palamau Upland has a highly dissected terrain having $2-4^{\circ}$ average slope rising at places to 6° . There are numerous interlocked spurs projecting westward from the Hazaribagh plateau extending in between the numerous

tributaries of the Auranga and Amanat rivers. The region is covered with deciduous forest. Lac collection is the main occupation. Rice cultivation is done in the valleys. There is no town worth mentioning and the area is highly inaccessible.

Chotanagpur South

The southern Chotanagpur consists of three distinct erosion surfaces namely, the *Patlands*, the Ranchi Plateau and the South-East Chotanagpur. The land descends from west to east in steps marked by bold scarps from one level to another.

The *Patland* Region is the extension of the Deccan trap at an average elevation of 900 m. It is composed of broad flat laterite-capped plateaus and intervening valleys. The highest amount of rainfall in Chotanagpur occurs here resulting in luxuriant forest cover of bamboo and sal trees. Bauxite is found here. The population is mainly confined to relatively broad rice-growing valleys. This region is highly inaccessible. Netarhat (2,085), a health resort, is connected with the Lohardaga-Gumla road. It can be divided into two sub-regions :

Ranchi Patland, lying in the Ranchi district, is comparatively more accessible. There is greater utilization of resources here. Bauxite is mined near Lohardaga and railed to Muri for processing. The valleys grow rice and carry comparatively more population.

Palamanu Patland is inaccessible and covered with thick forests. It is almost uninhabited. Forests also remain almost unexploited.

The Ranchi Plateau : The Ranchi plateau extending over most of the Ranchi district is bounded on all sides by steep scarps. It has a rolling level surface with residual hills, composed of resistant rocks. It slopes towards the south and the east. The drainage of the plateau is shared by the Subarnarekha and the South Koel. The soil is similar to other parts of Chotanagpur. It has largely subsistence agricultural economy over most of the area. It is divided into three sub-regions :

The Northern Ranchi Plateau typically exemplifies the characteristic features of the plateau. Agricultural economy is predominant. Settlements are mostly of semi-compact type and are evenly

distributed. Every village has some upland (*taur*) and lowland (*dons*). The *dons* (paddy lowlands) are terraced for rice cultivation, the soil being composed of sand, silt and clay. The relative proportion of uplands and lowlands in villages in most cases is 40 : 60. Rice and ragi with some fruits and vegetables are the main crops. Ranchi (120,000) is growing into an important industrial nucleus with the establishment of Heavy Engineering Corporation, apart from being the administrative and commercial centre. Roads from all sides converge here, in addition to Rourkela-Ranchi Chandrapura and Ranchi-Lohardaga railway lines.

The Southern Ranchi Plateau is a dissected region forming a rugged hill country with typical scenery of turbulent streams, steep hill-sides and cliffs, and narrow valleys. The main streams flow north-south while the subsequent streams have latitudinal arrangement and thus the area is cut into small rectangular blocks forming miniature plateaus. Spurs and re-entrants have resulted from the active erosion of longitudinal master streams. The ridges are mainly monoclinical. The population is very sparse and the settlements are scattered unevenly. The region is quite inaccessible. Dense forests could be good source of timber but remain largely unexploited. Small service centres like Khunti (8,156), Gumla (10,710) and Simdega (10,438) are located on its periphery.

The Southern Hilly region is an area of tangled hills and deep valleys. It extends along the main thrust zone from SW to NE. It is a heavily forested region. Settlements are few and far between, only the Ranchi-Chakradharpur road traverses this region with innumerable blind curves.

The South Eastern Chotanagpur includes the Singhbhum district and adjoining Purulia Upland. It has a general elevation of 75-150 m excepting the Dalma range and Baghmundi upland which are higher in elevation. The rainfall varies from 100 to 125 m. This region has varied relief and diverse economy. It is divided into five sub-regions :

The Chaibesa Plain lies in the south-western part. It has mainly agricultural economy with rice as the leading crop. Forest products are obtained

from the rugged hills and highlands flanking the plain. The plain slopes from south to north along the Kharkai Valley and south-west to north-east along the Garra Valley. It is a rolling plain studded with hillocks and granitic boulders. In the south-western portion iron ore is mined at Gua and Noamundi. There is a cement factory at Jhinkapani. Chaibasa (22,000) is the principal town.

The *Subarnarekha valley* extends from north-west to south-east. It is also known as the mica-schist plain. The valley has an average width of 10-16 km. There are residual hills spread all over the valley. The upper valley has good rice cultivation while in the lower reaches iron and steel and copper industries are located at Jamshedpur and Manbhandar.

The *Dhanjori Highlands* lie between the granitic Chaibasa plain and the mica-schist plain in a triangular form. It is an extensive highland region

of varying elevation in the south but turns into a series of low broken ranges in the west. Its average slope ranges between 2-8°. The hills are forested. The Jaduguda uranium mines are located on the northern flanks of these highlands.

The *Dalma Range* runs diagonally across the Subarnarekha river. It is a volcanic range belonging to the Archaean period. It is covered with forests and is practically uninhabited.

The *Purulia Upland* includes the Baghmundi plateau which is an extension of the Ranchi plateau. The land slopes gradually towards the east until it merges with West Bengal plain. It is inhabited by Bengali-speaking people and it now forms a part of West Bengal. Rice is the main crop and agriculture the mainstay of the people. Purulia (48,174) is the main town and the district headquarters.

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The Meghalaya Mikir Region (25°05'—26°41' N and 89°47'—93°36' E) comprising the Garo, Khasi, Jaintia and the outlying Mikir Hills is a tableland which is the eastward extension of the massive block of the Indian Peninsular shield from which it has been separated by the Malda gap as a result of denudational and tectonic forces. The region from the river Dhansiri in the east to the Singimari river on the west is about 400 km long with an average width of about 40 km, covering about 35,291 km². It stands high above to the south of the Assam valley at an altitude varying between 610 m and 1,830 m. It includes both, the Autonomous Hill State of Meghalaya and the district of Mikir Hills and the northwestern part of the North Cachar Hills district* of Assam.

The region is bordered on the north by Goalpara and Kamrup districts, on the west by the south-western part of the district of Goalpara and a part of Rangpur district (East Pakistan), on the south by the districts of Mymensing and Sylhet (East Pakistan), on the east by the Sibsagar district of Assam.

Historical Background

There is no integrated historical account of the Region, since it is occupied by different tribal groups who have till recently lived in physical isolation and have no script of their own. However, there is some reference about them in *Buranjis* of the Ahoms and the historical records of last century based on Ahom Chronicles supplemented by inscriptions, coins, copper plates and

structures particularly on the Khasis, Jaintias, Mikirs and Cacharis which provide some evidence of occupation of its northern fringe even before the Christian era. There is no evidence of pre-historic settlement of the region except for the recent claim by some scholars that the Rongram valley of the Garo Hills was inhabited in the Palaeolithic times, based on their findings in the Daojalihadang excavation site of the said valley.

Historical accounts suggest that there were waves of migrations into North-east India through the north-eastern routes and these migrants were rather invaders who belong to the "Indo-Chinese Linguistic family" of which two most important sub-families are the *Mon-Khmer* and *Tibeto-Burman*. The *Mon-Khmer* which constitutes the Khasis and the Jaintias, was driven by subsequent *Tibeto-Burman* hordes into the Khasi Hills which is the only part of north-east India in which that sub-family now exists. Of the *Tibeto-Burman* sub-family there were three groups, namely, *Naga*, *Kuki-Chin* and *Bodo*. The Naga and the Kuki were driven to the hills in the northeast and the Bodo dominated in the plains, the Garo Hills and the North Cachar Hills. The Bodos were later divided into a number of small linguistic groups such as *Garo*, *Kachari*, *Mech*, *Dimas*, *Tipea*, *Lalung*, *Rabha* and *Chutiya*.¹ Major Playfair opines that the Garos and the Kacharis were originally of one tribe, subsequently separated into two—the Kacharis spreading over the north and the Garos over the south bank of the Brahmaputra.² The Mikirs, a small tribe, apparently of Bodo origin and perhaps of the latest migration, live in the Mikir Hills. In origin they may be a mixture of the *Austriacs* and the Bodos.³ Nothing is known about the original home of the Mikirs. There are strong affinities of their language with the Kukis

* The northwestern part of the North Cachar Hills district which is structurally an extension of the Mikir Hills to the north-west comprising Archaean rocks, has been included under the material division of the Meghalaya plateau.

and of customs with the *Nagas*, but they still form a distinctly separate tribe which cannot be grouped with any of the other *Tibeto-Burman* races inhabiting the mountainous region between Burma and Assam. Whatever might be their ancient origin, in recent times, the Mikirs resided in strength in the North Cachar Hills, where raids by the Angami and Kaccha Nagas from the east and the Kukis from the southeast apparently drove them away to the Jaintia Hills. Being harassed again by the Synteng chiefs, they sought protection of the Ahoms, then ruling over the plains of Assam and since then they have been living peacefully in the region allocated to them.⁴

As regards the history of the Garos practically nothing is known. They are, no doubt, still very primitive. Till recently they have been carrying raids on the people of the neighbouring plains. The British physically occupied the Garo Hills in 1872 and prior to this, it along with Goalpara was administered as a part of Bengal from Rangpur since 1765 when the Moghuls handed over the province of Bengal to the East India Company. It became a part of Assam in 1874 when Assam was constituted a separate province.⁵ Since then, till shortly after Independence, when Tribal District Councils were established, the Garo Hills district was administered by a Deputy Commissioner. Earlier, the villages were managed by the individual village-heads called *Nokmas* who in turn elect the *Laskar* who functions as a magistrate over a region. But with the establishment of District Council, authority is gradually shifting from the villages to the centralised headquarters at Tura.

The history of the Khasis and the Jaintias may be traced from the early part of the 16th century only, because prior to this, there is no record or tradition that they ever owed allegiance to a single prince. When they first emerged from obscurity, they were split into numerous communities each under its own head. The most well-known in the 16th and 18th centuries are only the Jaintia Rajas (Kings) and to some extent, the *Syiem* (Raja or chief) of Khyrim in the Khasi Hills.⁶ It is supposed that the earliest Jaintia Raja reigned from about A. D. 1500 and the Jaintia Hills area was formed into a single kingdom with capital

at Jaintiapur and had within its jurisdiction a tract of plain country lying between the town of Sylhet and the Cachar border and also the territory stretching from the foot of the Hills overlooking the Barak Valley to the Kalang river in Nowgong district. Having lived in the plains for long, the Jaintia Rajas were brought to some extent under the influence of the Hindus. They had diplomatic ties with the Ahom and Kachari kings, but on 15th March, 1835, the last of the Jaintia Rajas, Rajendra Singh, was dispossessed of his kingdom by the British.⁷ The Khasis previously had been known only as troublesome marauders upon the plains of Sylhet. A line of forts was kept up under the hills to check their incursions. The Khasi Hills came under the British in 1883 with the submission of the last of the important *Syiems*, Tirot Singh. There were 30 *Syiems* or kings ruling over their respective territories and 12 *dolois* or small rulers when the British came to the area.

The history of the Mikir Hills may be traced back to the days of the Varman rulers in the 7th and 8th centuries much before the Mikirs settled there. In fact, the whole area was under the full control of the *Varman*, the *Mlechhas* and the Pala dynasties as testified to by innumerable archaeological Hindu temples and images of the Mikir Hills area from Parokhowa to Dighalpani on one side and Numaligarh to Deopani on the other. The Mikirs who were occupying the north Cachar Hills areas under the rule of the Pala dynasty, could live there peacefully for sometime after the fall of the Palas till the Kachari kings of Dimapur subjugated them through their Viceroys. Being oppressed by the Kachari officials, they migrated to the Jaintia Kingdom and settled in Rongkheng near Lanka in Nowgong district. But they could not settle there permanently as they were oppressed by the Synteng Chiefs (Jaintia Rajas) and ultimately they were settled by the Ahom king in their present home, the Mikir Hills. However, before the arrival of the British, they led a precarious life, one section being under the Ahom chief at Raha, another under Tularam Senapie at Moudanga and the third section under that Jaintia King. There was still the fourth group

between Golaghat and Dimapur owing allegiance to none but strongly maintaining their position against the Nagas.⁸

There are a few Kacharis, known as Dimasa Kacharis who live in a small tract of the Meghalaya south of the Mikir and southeast of the Jaintia Hills. They belong to the Bodo family and it is believed that they are the off-shoots of the Kacharis people who migrated southward from the Brahmaputra Valley to the North Cachar Hills in the 16th century when their early capital, Dimapur, was destroyed by the Ahom king. Their subsequent history is linked up with other groups of the Kachari people inhabiting the North Cachar Hills and Cachar district.

The set up of the Garo Hills was purely rural and there were hardly any large settlement or communication line worthy of note. Among the old administrative centres, Jaintiapur, Nongkhlaw, Mairang, Nartiang, Raliang and Khrungma situated in the Khasi and Jaintia Hills are worth mentioning. There were as many as 30 Khasi confederates, the most important of the confederated states being (i) the State of Ossimlee ruled by the Nongkhlaw Raja, (ii) Principality of Khyrim consisting of seventy villages, (iii) Bormanik's country with 28 villages and forming a part of the province of Khyrim, (iv) the Kingdom Churra with 25 villages, (v) the State of Nurtung with capital at Nartiang, (vi) the Principality of Nuspung with 20 villages, (vii) the Muriow Kingdom with 25 villages, (viii) the Maharam principality consisting 24 villages and (ix) the State of Ramrye.⁹ These principalities existed from the 16th century till the arrival of the British in early 19th century. It may be noted that while the Khasi Hills region was split into a large number of small States, the Jaintia Hills formed only one kingdom, known as the Jaintia Kingdom. The Garo Hills region was not under any chief or Raja but was rather divided into as many as 200 tiny States under independent tribal chiefs.¹⁰ The Mikir Hills region formed a part of the Kachari kingdom till the occupation of the area by the Ahom kings.

Under the British, the cultural landscape of the region underwent considerable changes through

development of settlements and communication lines, particularly after the formation of the Khasi and Jaintia Hills district in 1835 and the Garo Hills district in 1866. The tiny village of Cherrapunji was selected in 1827 as the capital of the Province, which, owing to heavy rainfall (1,300 cm), was shifted to a place known as Yeddo (later named as Shillong)¹¹ in the Khasi Hills in 1864. Shillong has since then developed into a really good administrative headquarters-cum-sanatorium. A few years later in 1867 an extensive survey in the Garo Hills was made for the selection of a site for the headquarters of Garo Hills, and subsequently the present town of Tura came into existence as the first urban centre in Western Meghalaya. Jowai (1872 Pop. 4,502) in the Jaintia hills also became an important town by that time.

Steps towards development of roads were undertaken by the British for administrative convenience. In 1877 a road, 107 km long, joining Shillong with Gauhati via Barapani, Umsing, Nongpho and Burnihat with sharp hair-pin bends was opened for wheeled traffic. Earlier a road running from Gauhati across the hills via Nongkhlaw, Mairang, Mawphlang, Cherrapunji, Mawsamai, Mawblang and Theriaghat to Bholaganj in Sylhet for a distance of 208 km was constructed, which was taken care of partly by the inhabitants of the native States of K. and J. Hills and partly by the British Government. However, this road lost its importance after the construction of the Gauhati-Shillong Road. By 1875 the Garo Hills also witnessed the development of good roads running from Harigaon on western border of the Garo Hills to Tura for a distance of 32 km and beyond Harigaon continuing through Goalpara district to Monicachar on the east bank of the Brahmaputra and from Tura to Dalu though not in good condition.¹²

The development of the region has been further accentuated since Independence. The North Cachar and the Mikir Hills district was formed in 1951 with Diphu as its headquarters. The formation of the Autonomous Hill State of Meghalaya, comprising the Garo Hills and the K. & J. Hills, in April, 1970 has envisaged an ambitious development plan.

The Physical Setting

Geology, Physiography and Drainage

The Meghalaya Plateau has indeed a chequered evolutionary history of emergence, submergence and peneplanation with several phases of erosion, sedimentation, diastrophism, intrusion, movements of land and sea and emissions.¹³ It is a fragment of the super-continent of Gondwana and contains within its bare face the marks of peneplanation which ranges from pre-Cambrian to Recent and sub-Recent periods. The higher parts of the plateau preserve marks of Gondwana surface, while later cycles are traced below them. Thus, emergence of the pre-Cambrian Gondwana Block is attested in this plateau. Later, it was submerged partially by the encroaching sea during the Mesozoic and early Tertiary times and was uplifted slowly from the bed of the sea at the time the Himalaya rose from the floor of the Tethys. The orogenic movement was so slow and free from buckling that the sedimentary beds retained their horizontal character and gave rise to structural platforms well-developed in the Cherrapunji area.¹⁴

It is, however, worthwhile to mention here that the plateau had experienced the influence of an alternate phase of transgression and regression of the sea waters from Mesozoic to Early Tertiary times and also the development of deep fissures sometime during the Upper Jurassic period, along its southern flank through which a great volume of lava erupted.¹⁵

The plateau is mainly constituted by the rocks of the pre-Cambrian age consisting of a group of hard crystalline granites, gneisses and granulites. The pre-Tertiary and Tertiary rocks occur above these rocks on the western and southern margins of the plateau. The geological succession is as follows :¹⁶

The plateau is an autochthon of crystalline rocks that constitute the Foreland spur of the Indian Shield. The rocks are isoclinally folded and lined with a plunge from moderate to steep. The plunge of lineation at places becomes vertical, a good example of which is a fold at Ranga Pahar area where lensoid bodies of massive sillimanite occur in the core. But folds in the Shillong Series, comprising mostly quartzites with shale, slate and conglomerates, are not frequent and those that occur are in general open, asymmetrical folds with steep axial planes and gently plunging axes.¹⁷ The pre-Tertiary and Tertiary rocks on the plateau lie almost horizontally except in its southern parts where beyond Mahadek they become moderately to steeply inclined and conceal themselves below the Bengal alluvium. The plateau abuts against the Tertiaries along its southern margin, the line of contact being a tear fault, the Dauki Tear Fault, which continues westward from Haflong in the North Cachar Hills, reaches the boundary of the alluvium of the Surma Valley at Dauki and continues to Dalu in the Garo Hills.¹⁸

The plateau presents a polygenetic surface with some defined peneplains at varying altitudes of

Alluvial deposits (thin)

Tertiary	Jaintia Series of rocks comprising mainly sandstones with clay, coal seams and fossiliferous limestones.	Eocene including Palaeocene.
Mesozoic	Langpar and Mahadek Stages of rocks comprising mostly arkose with shale, conglomerates and fossiliferous limestones.	Upper Cretaceous
Palaeozoic	Sylhet trap	? Jurassic
	Gondwana rocks of the Garo Hills.	? Permian
Pre-Cambrian	Milliem granite and its equivalents; Khasi greenstone : lava and ash beds; Shillong series, mostly quartzites with shale, slate and conglomerates; The Basement Complex.	

1,860-1,920 m around Laitkor and the Shillong peaks, of 1,440-1,500 m at Shillong proper and of 1,410 m in Umkhrah valley. The plateau was peneplained before the sandstones and shales of Shillong Series were unconformably laid down during the Huronian period. It was repeneplained during the Palaeozoic era. But again, with the elevation of the plateau during Mesozoic, the denudation cycle completed its phase to produce another peneplained surface. It is at this time, during the Jurassic period that a great volume of lava eruption intervened the erosional cycle which registered significant impact on the landscape development of the plateau. Later, the plateau witnessed an incursion of the Cretaceous Sea from which the landmass emerged during Eocene and mid-Miocene to initiate the Tertiary landscape cycles. The Tertiary sea undoubtedly touched its fringe but it retreated subsequently. However, it may safely be regarded that the landscape of the plateau suggests senility, but along its rims, juvenile features punctuated it at various levels.¹⁰

The physiographic characteristic of the region is remarkable due to the highly dissected and irregular terrain in the western and northern faces in

contrast to the regular and steep fall of the southern face, down to the Barak-Surma plain through a faulted face (Fig. 18.1). The interesting physiographic feature in the north is that the boundary of the plateau is not very well-defined, there being broken ranges of low irregular hills stretching across lower and central Assam to the northern border of the Assam Valley closer to the foothills of the Himalaya.

The western part i.e., the Garo Hills is an extensively dissected tract of 8,164 km² with an average elevation of 600 m or less. Amongst several peaks the Norkek situated 13 km south-east of Tura on the Tura Range records the highest elevation (1,515 m). The Mohekhola Adaguri range is the demarcating line of the western and central part of the plateau. The most important physiographic features of the Garo Hills are the Tura Range and the Simsang Valley. The Tura Range runs almost through the centre of the Garo Hills due east and west extending from Tura town to Siju, a distance of 50 km. The hills in the north of the Tura Range including the Arbela Hills running parallel to the Tura range are low but gradually increase in height until they reach the latter in the south. The Tura Range is a

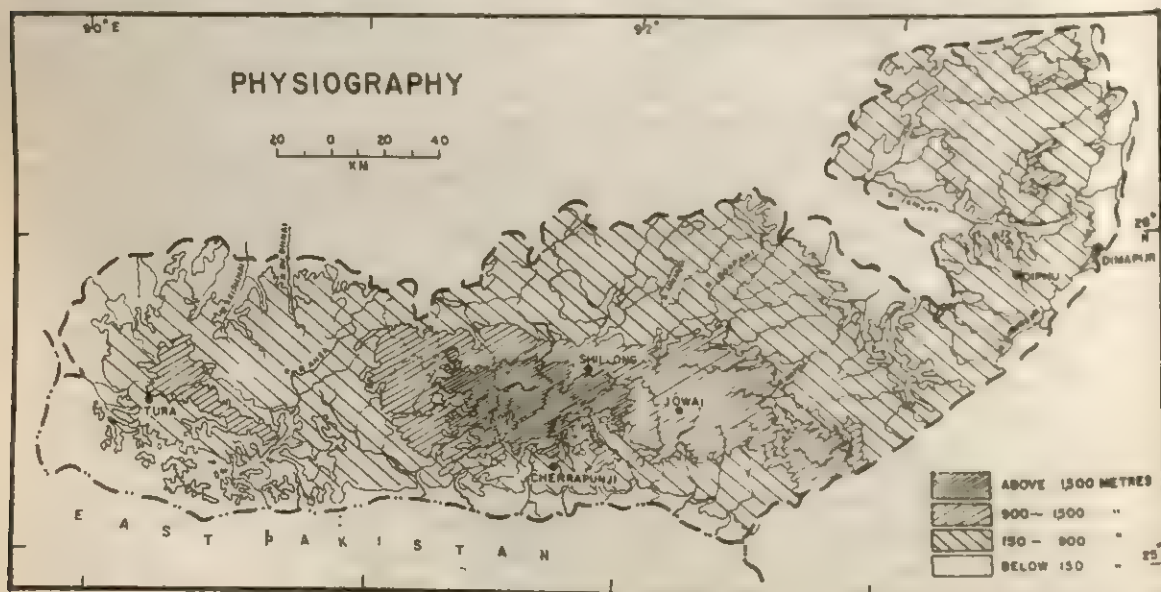


Fig. 18.1

typical horst bounded by two fault lines and it is along the northern fault line that the Simsang river flows eastwards for about 45 km before turning south through a gorge, separating the Tura Range from the Kylas Range, and ultimately coming down to the plains near Baghmara where it is known as the Someswari river. The Kylas Hill which lies east of the Someswari river, called Chitmang by the Garos, stands out as an abrupt hog-back mass, which towers above most of the hills in the vicinity. It, thus, appears to be higher than it really is, and it is probably on this account that it is regarded by the Garos as the home of the spirits of the dead.²⁰ The rest of the area of Garo Hills consists of a tumbled mass of hills, whose general tendency is to run north and south with several low peaks between 450-600 m.

The rivers in the Garo Hills make two distinct systems separated by the central Tura Range, one flowing to north towards the Brahmaputra and the other to south to the Surma. The important rivers of the northern system from west to east are the Kalu or the Gonal, Ringgi, Chagua, Ajarar or Didak, Didram, Krishnai or Damring and Daudhani or the Manda. Of these rivers only the Krishnai and the Kalu are navigable (Fig. 18.1). The important rivers of the southern system from west to east are the Darong, Sanda, Bandra, Bhogai, Dareng (Nitai), and Simsang or Someswari. Of these the Simsang is the largest stream in the whole of the Garo Hills and is navigable for fair-size boats as far as Siju about 32 km from the point where it rises from the hills. Its principal tributaries are Rongkai, Rongdi and Chibok. The other navigable rivers of the southern system are the Nitai and the Bhupai.

The central and eastern parts of the Meghalaya i.e., the district of United Khasi and Jaintia Hills is a true plateau (14,375 km²) with its senile topography and flat skyline. This can physiographically be well divided into three distinct units: 1. The northern undulating hills, 2. The central upland zone, and 3. The southern precipitous face of the upland.

The northern hills with accordant summits (170-820 m) gradually slope down towards the Brahmaputra Valley and form, therefore, the sub-

montane region of the Central Meghalaya, called the *Bhoi* country by the Khasi and Jaintia people. There are two terraces indicating two peneplain surfaces, one from Khanapara to Jorhat and the other from Burnihat to Nongpoh. The northern hills are separated from the more higher central upland by an important fault line. The alignment of the hills from Nongholi to Burnihat is from NE. to SE. Above 490 m most of the hillocks are conspicuous by their flat-top character.

The central portion running E-W consists of the plateau proper and covers more than one-third of the central and eastern Meghalaya. Its outer limit is defined roughly by the 1,500 m contour. The Khasis and Jaintias call this plateau section *Ri Khasi* and *Ri Jaintia* in their respective areas. In general, this zone consists mostly of rolling grassy downs, intersected with river valleys and dotted all over with soft rounded hills with fresh soft turf which from a distance looks as soft as a velvet. The Central Upland zone contains remnants of seven peneplaned surfaces, ranging in height from 1,500 m to 2,083 m, thus preserving the several traces of erosion cycles in this part alone.²¹ The Shillong hills towering above Shillong town contain the highest peneplaned surface trending E. S. E. to W. N. W. over which streams meander before plunging into the deep valleys of the Umiam and the Umkhen. The presence of many rapids and waterfalls in the neighbourhood of Shillong indicates that this region has a youthful topography due perhaps to a recent uplift.²² This part consists, in fact, of undulating knolls and gentle slopes and seen from the air it appears to consist of small hillocks closely knit together. The Shillong peak, the highest peak of the area, located just south of Shillong proper, with an altitude of 1,961 m, is in fact a hill top rising above the gentle range of such hills which on the northern side disappear into the Laitkor plateau where the Laitkor peak is another similar hill top. Towards the west of Shillong, there is a hill range called Diengiei which rises up to 1,823 m. The southern face of the plateau locally known as *War* country consists of the steepest parts of the region. This part in its northern fringe, to the south of the Shillong hills,

has a typical granitic topography with rounded hills and shallow valleys composed of the Myllem granite. Farther south beyond Myllem there is a vast structural platform on which stands Cherrapunji. This part is built of gently dipping sandstones of Cretaceous age, and over its edge is located the magnificent Mawsmai waterfalls. This structural platform stands as an escarpment and its face has been attacked by fluvial erosion due to extremely heavy rainfall and as a result of which a number of platforms, namely Cherrapunji, Lyngkyrdem and Mawsynram, have been formed. Over the Cherra platform a number of small, rounded limestone hills of the Eocene age are found scattered, some of which contain small caves with narrow underground passages and characteristic limestone features such as stalactites and stalagmites and pot-holes. From Cherrapunji the terrain has a gentle slope southwards for about 7 km and then falls rapidly to the Sylhet plain, the ground slope conforming to the high dip of the sedimentary rocks. Towards the Surma Valley the abrupt slope in many places has given rise to deep precipices due to heavy rainfall.

It may be mentioned here that although the Jaintia Hills area forms a contiguous part of the central Meghalaya of the Khasi Hills with the same physiographic divisions as the Northern hills, Central Jowai Upland and Southern escarpment, is relatively lower having general elevation a little over 1,200 m. The Jowai Upland (1,500 m) with ridges running E-W acts as a watershed between the Surma Valley and the Brahmaputra Valley. The Jaintia hills in general have more flat lands than the Khasi hills.

The drainage system of the central and eastern Meghalaya is to a great extent directed by the central upland zone which acts as the watershed from which the rivers flow down to the Sylhet plain in the south and Brahmaputra valley in the north. Of the northern group of rivers the important ones are the Khri or Umkhri, the Digaru, the Umium, etc., while those of the southern system are the Kynchiang or Jadukata, the Mawpa, Umi-ew-Umiam or Bagapani, Myngot or Maneshbhil, Myntdu, etc. The characteristic feature of the northern rivers is that most of them have formed

plain embayments at their entrance into the plains, thereby making the northern boundary of the plateau fairly irregular. Conversely, the southern rivers debouch onto the plains in deep ravines in the faulted face of the southern boundary.

The easternmost Meghalaya comprising the detached Mikir Hills is partly isolated being surrounded by plains on three sides. Its link with the Meghalaya proper is towards south through a patch of highly denuded and subdued senile terrain. It has been subjected to extreme weathering and denudation and as a result the resistant sandstones of the Surma Series which underlie them have contributed to the characteristic rugged topography with a number of hills purely of relict type. The truncation of this part out of the main plateau is mainly due to the shales of the Barail Series, exposed in valley bottoms, which help in valley-widening. The Mikir Hills area has roughly a northerly slope with the outer ranges of the Mikir Hills having an average elevation of about 450 m. But in the central portion, east of the Kopili which has formed plain embayments into the interior of the Mikir Hills causing the major part of isolation of this section from the main plateau, the average elevation of the ranges is about 1,000 m. The northern ranges which extend from Dabaka (Nowgong District) in the south-west to Bokakhat (Sibsagar Dist.) in the northeast have an average elevation of 600 m. The southern ranges known as the Rengma Hills are higher with an average elevation of about 900 m and extend from Baguliaghat in the southwest to Barpathar in the northeast.

The drainage system of the area is characterised by a radial pattern as rivers emanate from the dome-shaped central portion of the hill range in the north-eastern area of the easternmost section of the Meghalaya. The main systems are that of the Dhansiri and the Jumna (Fig. 18.1). The area in the south and west beyond the Rengma Hills is drained by a series of streams which fall into the Kopili river.

Climate

The climate of the region differs from that of the Brahmaputra valley mainly due to its high relief

which, in general, makes the climate very salubrious while that of the Brahmaputra plains is comparatively much warmer in summer and cool in winter. However, it is worthwhile to note that only the climate of the central part of the Central and Eastern Meghalaya (Khasi and Jaintia Hills) is conducive, whereas in the western Meghalaya (Garo Hills) except for the winter (November to February) it becomes oppressive as a result of high temperature, heavy rainfall rendering the atmosphere exceedingly steamy, although the temperature is slightly moderated by copious rainfall. The climate of the Mikir Hills is uncomfortable except in winter and becomes oppressive during monsoons leading to malarial conditions, which have been bringing unprecedented havoc wrought by Kalazar (Blackwater fever) to the people.

A relatively low elevation of the Western Meghalaya is responsible for a fairly high temperature for most part of the year, i.e. from February to October with April as the warmest month having the mean maximum and mean minimum as 34.9°C and 22.1°C respectively. The month of May inspite of its heavy rainfall (513 mm) records the second highest temperature in the year with 33.1°C and 22.8°C as the mean maximum and mean minimum respectively. The temperature of the coldest months, December and January, records a mean maximum of 24.9° and 24.8°C respectively with their mean minimum as low as 11.6°C and 11.1°C respectively. The average annual rainfall in western Meghalaya is 2,689 mm of which more than two-thirds are received in the four months, May to August. Winter is conspicuously dry with less than 50 mm in four months, November to February. The rainfall decreases from south to north as the moisture-bearing southwest monsoon winds strike the southern part first causing heavy downpour, while the central Tura range obstructs their path to the north. The average annual rainfall in the southeast is above 4,000 mm whereas in the north it is between 2,500-3,000 mm.

The climate of the Central and Eastern Meghalaya is bracing due to the high altitude and consequent moderate temperature particularly in the

Central Upland zone. But at the foot-hills of the southern slopes and sub-montane regions in the north and east the climate is slightly humid and warm. The Shillong region in the Central Upland zone experiences very cold nights in winter where the temperature goes down to about 1.7°C. The temperature seldom rises above 26°C in any part of the year. During deep winter (December-January) one usually experiences frost in the Shillong plateau although snowfall is unknown in the area. The most interesting climatic characteristic of this part is the very high rainfall with an average annual of 7,196 mm which distinguishes this area climatically from other parts of the Meghalaya. However, there is great variation of rainfall within this region from south to north. This is primarily because the higher part i.e. the central upland zone having an E-W alignment renders a rain shadow effect on the areas lying to the north. Consequently the rainfall in Cherrapunji which is located in the structural platform on the south is as high as 12,033 mm, while Shillong being located only 50 km to the north with a rain-shadow effect gets only 2,296 mm. Mawsynram, a village situated on a similar plateau as the Cherra plateau, about 16 km west of Cherrapunji, records the highest rainfall in the world with 13,923 mm (based on the recent averages). The highest rainfall in Cherrapunji-Mawsynram region is due to the fact that southwest monsoon laden with great amount of moisture from the Bay blows over East Pakistan and is suddenly cut by the cliffs of the table land in the south with an average elevation above 1,200 m which juts out like a peninsula into the surrounding gorges about 600 m deep on either side, and as a result the monsoon having reached the heads of the gorges ascends vertically upwards and causes very heavy rainfall. Jowai which is located on the ridge of the eastern section of the central upland receives greater amount of rainfall than Shillong with 3,077 mm, as it does not experience a rainshadow effect. This figure, however, is much below the average for Khasi and Jaintia Hills mainly due to the high rainfall figures in the Mawsynram-Cherrapunji region. The rainfall decreases further north due to sig-

nificant rain-shadow effect and as such the northern slopes experience 1,270 mm-2,032 mm rainfall.

Contrary to the Central and Eastern Meghalaya, the climate in the Mikir Hills region, is not bracing as a result of high temperature during the summer months and low rainfall due to its location in the rain-shadow zone. The rainfall even in the monsoon period is considerably low as the moisture-bearing monsoon winds are obstructed by the Barail Range before they could reach this part. The total rainfall in the region is about 1,200 mm out of which about 1,100 mm occur during the pre-monsoon and monsoon periods. However, the rainfall in the western section is considerably higher than that of the eastern part. The winter months remain almost dry. July is the hottest month with an average temperature of 28°C and the winter months have a temperature of 14°C on the average.

Soil

There are three main types²² of soils in the Meghalaya plateau : the Red Loam or Hill soils, the Laterite soil, and the Old Alluvium (Fig.18.2).

The Red Loam or Hill soils occupy almost the entire region except a limited tract in the foothills and submontane fringes and a pocket in the southwestern Mikir Hills adjoining the Jaintia Hills. These soils are generally loamy, varying sometimes between clayey and sandy loam and are rich in organic matter and nitrogen. These are usually acidic and are good for the cultivation of fruits, potatoes and rice in hill slopes and terraces. The soil is, however, deficient in available phosphate and potash.

The laterite soils of the plateau are confined to a small fringe extending from west to east in the northern border of the plateau with its important concentration in the southwestern part of the Mikir Hills adjoining the Jaintia Hills. These soils are highly leached, poor in plant nutrients and acidic in reaction. These are not of much agricultural importance and are only workable after rains, but usually harden on drying. These soils, however, can be used well for agricultural purposes by heavy incorporation of organic matter which improves the tilth and fertility.

The old alluvium is found in the highlands areas bordering the plains, all along the northern fringe

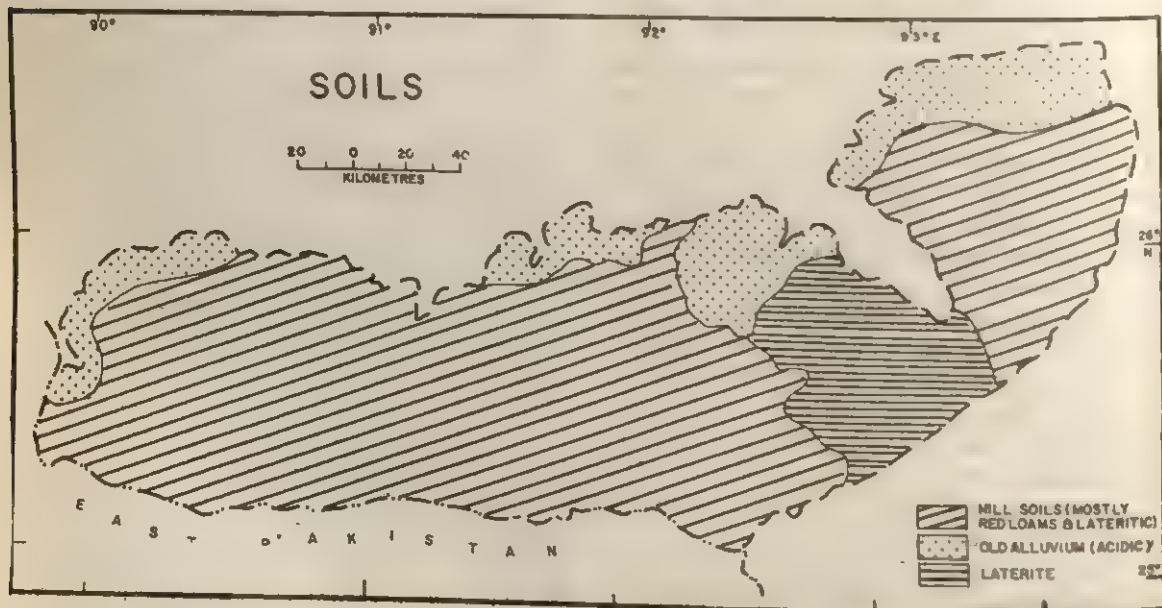


Fig. 18.2

of the region. These soils occupy very low percentage of the region and are usually very much acidic in character. In texture they vary from sandy to clayey loam with a varying degree of nitrogen from high to low content. They are deficient in available phosphate but have an appreciable amount of potash. These soils are used for the cultivation of rice, fruits, vegetables and tea (a limited acreage) in the Mikir Hills region adjoining the Nowgong and Sibsagar districts.

Vegetation

Although the vegetation of the Meghalaya plateau is extremely varied and interesting from the botanical point of view, yet the area under forest is considerably insignificant in comparison to the surrounding regions. It is striking to note that inspite of the heavy downpour in the southern face of the Central Meghalaya where one usually would expect a dense evergreen rainforest, the entire area is bleak and dreary with hillocks and the landscape is covered here and there with grass through which the underlying rocks project out from the very badly leached soil surfaces. This is mainly due, on the one hand, to the effect of the terrain with steep slopes and on the other, to the structural character of the limestone rock beds which lead to a quick draining off of the rain water of the area. The Western Meghalaya is characterised by vegetational cover almost similar to the Lower Brahmaputra Valley region where there is a distinct absence of grass vegetation. Here both the northern and southern low-hills have mostly dense tropical mixed vegetation with predominance of *Sal* forests and dense thickets of bamboo. But there occurs a small patch of temperate vegetation in the higher parts (above 750 m) of the Western Meghalaya on the Tura Range where the important species are the pines and firs. The principal bamboo species are the *Dalu* and *Muli*. Though *Sal* is the principal timber species of Western Meghalaya, there are a few other useful species such as the *Gurgra* and the *Haidu* known for their commercial value for plywood. Cane reserves and small quantities of *Agaru* species are found in this area. The vegetation of the Central and Eastern

Meghalaya may broadly be divided into : (a) the mixed tropical evergreen hardwood forest in the northern and southern parts up to an elevation of about 300 m where the main species are *Sal*, *Sam*, *Chapa*, *Gomeri*, *Bola*, etc., besides the thickets of bamboo, cane and wild banana trees on the slopes of the narrow valleys; (b) the rolling grass land of the lower parts of the undulating central plateau within an elevation of 300-750 m where trees and shrubs are insignificant although scattered stands of pine trees are seen in the rolling downs of grass lands; (c) the Pine forest of the higher parts of the Central and Eastern Meghalaya above 750 m particularly around the Shillong hills where the main species is pine, found along with its associates like Willow, Birch, Mokrisal, Oak, Magnolia, Beech and other miscellaneous trees besides the beautiful rhododendron flowering at higher elevations (above 1,200 m).

Unlike the Western, Central and Eastern Meghalaya, the Mikir Hills region has a high density of forest areas with vegetation more similar to the Central Brahmaputra valley. The vegetation here is characterised by dense reserves of bamboos and grasses with a few scattered miscellaneous trees here and there. The trees may be broadly divided into the wet type of forests consisting of *On tenga* and *Ajbor* with a small number of poor quality *Sal* and the dry type of forests consisting of grass, shrubs, and miscellaneous trees such as *Bogari*, *Simul*, *Gobora*, *Dimaru*, etc. It may be mentioned here that some important species like *Wabing* and *Tita* have been successfully planted in the northeastern part of this region.

The Cultural Setting

Population

The region is sparsely populated due to its rugged terrain and inhospitable environs. It has about one million population with as low density as 28 persons per km² (1961) in contrast to 162 in the Assam valley. The urban population comprises 11.8 per cent of the total population. Though the percentage of urban population is higher in this region than the neighbouring regions, it may be noted here that the crowding of urban population in the Shillong town-group is

solely responsible for this, which otherwise would have been very insignificant, because the urban population in the entire region excluding the Shillong town-group is only 15,085 with a greatly unbalanced rural-urban ratio of 58 : 1. The striking rural character of the Mikir Hills is also notable. The overwhelming rural character of the Region is mainly due to its hilly terrain and inaccessibility, which have so far kept the area considerably isolated from the neighbouring plains.

The population of the plateau in 1901 was only 373,524 (Western Meghalaya : 138,274, Central Meghalaya : 202,250, and Mikir Hills : 33,000 approximately) which increased to 998,787 in 1961, the percentage increase being 167, which is lower than that in Assam as a whole (220%) and the Brahmaputra valley (250%). The decennial growth of population in the region in general has been unsteady since 1901 which is more significant in the case of Mikir Hills.

The growth of population is spectacular in the two decennial periods, 1931-41 and 1951-61, (29.8% and 37.07% respectively). In fact, the population in the region had a steady and remarkable rise from 1921 till 1941 but after that there was a significant fall in the rate of growth till 1951 probably due to the effect of Second World War. Again, the rate of growth was greatly accelerated from 1951 to 1961 due mainly to low death rate, influx of people from Assam and outside, especially from East Pakistan, and the steps taken for the development of industrial and commercial activities in the region, especially in the Khasi Hills. The rise from 1921 to 1941 was, apart from the natural increase, due to the slow but gradual migration of people from East Bengal to the bordering areas of Western and Central Meghalaya on one hand and to Shillong, the growing urban centre and State capital of Assam, on the other. It may be noted here that during 1951-61 a considerably large number of people were added as new employment opportunities developed as a result of the implementation of the different developmental schemes, such as, establishment of hydro-electric projects, exploitation of mineral resources and acceleration of edu-

cational and urban activities etc., in the area in and around the Shillong town-group. Further, the percentage growth of population in the Mikir Hills during 1951-61 is seen to be abnormally high (86.51%). This is largely owing to the heavy influx of Pakistanis.

The regional variation in the density of population is not very significant. It varies from 18 persons per km² in the east to 38 in the west. The urban growth in the region was anything to be taken significant notice of till late nineteen fifties. It is only in 1961 census that the region has recorded a sizable urban population, 117,483, and that only in this census year Tura in Western Meghalaya and Jowai in Eastern Meghalaya have gained urban status. The Mikir Hills has yet to have any urban population, although Diphu, the headquarters of the Mikir Hills with its central location and good railway and road communication, is growing as an important rural service centre and is sure to gain the urban status in the 1971 census.

The sex ratio in the region stands at 919, but the urban sex ratio, as usual is low (764). The number of males in all the sub-regions is higher than the number of females except in the Eastern Meghalaya where the sex ratio is 1,015. The relationship is similar in both the urban and rural areas in the region. The percentage of literacy in the region is 24.63 (1961). This high percentage is due to the fact that in the Central Meghalaya region alone 31.02% of people are literate. In fact, the literacy in the western and the Mikir Hills plateau is below 17%. The percentages of literacy for males and females separately are 30.73 and 10.00 respectively.

Local tribal religions and persuasions comprise 35.20% of the total population but when considered as single religious groups, the major ones are the Hindus (32.86%) and the Christians (28.87%).

Occupational Structure : More than half of the total population (53.29%) are active workers, which is due to the high participation of females in earning their livelihood. The percentage of active workers in the rural areas (55.39) is considerably higher than that in the urban areas (37.55).

The main occupation of the region is agriculture which engages about four-fifths (79.19%) of the total active workers. People engaged in different activities are only 6.75% of the total workers. The percentage of workers engaged in other occupations are : 2.09 in trade and commerce, 0.39 in transport and communication, 0.42 in construction and 11.16 in other services, particularly in government offices, educational and other essential services.

The Tribal People : The primitive communities living in the Meghalaya-Mikir region are the Garos, the Khasis, the Mikirs and the Kacharis. The Garo hills are chiefly populated by the Garos and the Koches. The Koches are very few in their strength (1.9% of the total Garo hills). The Garo population is 242,075 of which only 190,901 recorded Garo as their mother tongue in 1951. The Garos inhabiting the hills are popularly known as *Paharis*, the hill Garos and those who live in the plains are known as *Lamdani* or the 'Plain Garos'. In general, the Garos are short with marked Mongoloid traits. However, sharp differences are seen between the *Paharis* and the *Lamdanis*. Most of their domestic utensils are made of local woods, chiefly bamboo. The principal garment of the male Garo is the *Gando*, a strip of cloth 15 cm wide and between 1.8—2.1 m long. The dress of female Garo consists of a piece of cloth 46 cm long and just broad enough to meet round the waist as a petticoat. However, the bark-clothes can still be seen in the interior Garo villages.

They have their own social system. Mother is the owner of the family property which is transmitted to one of the daughters known as *Nokna*. The *Nokpante* or the bachelor's quarter for the young unmarried, situated at the centre of the village, plays an important role in imparting the social, educational and recreational norms. They worship the thunder, lightning, rains, wind, earthquakes, shooting stars, and offer sacrifices to these forces.²⁴

The Khasi and Jaintia hills are populated chiefly by the *Matriarchal Khasis*, *Syntengs* or *Pnars*, *Wars*, *Bhois* and *Lyngams*. The total strength of Khasis is 292,923 (1951). The Mikirs are the inhabitants

of Mikir hills. The total Mikir population is 129,799 (1931).

Settlement

The region is characterised by dispersed and hamleted settlements obviously due to the dissected plateau terrain, thin soil cover, limited arable lands and less effectiveness of precipitation. The 'negative-area' effect of the plateau was mainly responsible for non-occupation of the region in the historical past. Even today there are only 5,879 villages of which about three-fourths are with a population below 200. The number of urban settlements is only six, out of which four are in the Shillong town-group and the other two in the Western and Eastern Meghalaya regions.

Rural Settlements : Most of the settlements (78.53%) are of very small size (pop. less than 200) with an average of about 150 persons per village and accommodate 44.36% of the total rural population. The next size class (200-499) comprises 17.26% of total settlements accounting for 34.30% of the total rural population. Villages with over 500 population are only 4% of the total. In the entire region there is only one settlement i.e., Diphu in the Mikir Hills having a population above 2,000. But this settlement is in fact a district headquarters though enumerated as a rural settlement in the 1961 census.

In contrast to the plains the rural settlements in the Meghalaya plateau are confined to the gentle slopes and intermontane valleys, suitable for agricultural activities—a few households usually controlling large areas on account of less productivity of land. The percentage of small-sized settlements in the Western Meghalaya is the highest and actually some of the villages have less than 10 persons each. This is due to the fact that people in the Garo Hills mostly live by shifting cultivation, for which only a few of them live in a village keeping around them big jungle area for the purpose. This is also true for the other areas of the plateau but to a smaller degree.

The houses in the village, though are grouped together, as is usual in tribal communities, they are invariably separated by individual compounds of considerably bigger size than in the plains.

The building materials are commonly wood and bamboo. The use of wood is more significant in the higher areas, particularly in the Central Meghalaya region, where it is used for the walls, floors, and roofing. In the Mikir Hills and Garo Hills the houses are generally of thatched roof with wood or bamboo walls. The thatching is done by *Kher* (a kind of superior quality grass), *Nara* (stems of dry paddy plants), and *Tokou* leaves. The roofs of houses are usually inclined due to incessant rainfall during monsoon periods. The houses on the slopes particularly in the higher parts, are characterised by *Chang-ghar* (platform houses), the floor being made of wooden planks supported by wooden posts so as to adjust on the slope a level floor.

Urban Settlements : Of the six urban centres in the region, Shillong with its three satellite towns (Shillong town-group) is the only conspicuous urban concentration in the plateau comprising 102,398 persons out of the total urban population (117,483). It is developing owing mainly to the administrative base. In fact, all the satellite towns of Shillong (Shillong Cantonment : 11,348; Nongthymmai : 10,084; Mawlai : 8,528) are contiguous suburbs of Shillong proper (72,438), and they have grown separately to accommodate the growing population of the State capital. It is also very likely that Happy Valley, Umpling, Pythorunkhrah, Upper Shillong and Umtyngka would become new satellite towns of Shillong in near future. The other two towns in Eastern Meghalaya (Jowai : 16,197) and Western Meghalaya (Tura : 8,888) have essentially grown up for carrying administrative functions. In addition to these, a number of market centres with considerable urban amenities are growing by the side of the main roads. Notable among such centres are : Diphu, Bokajan, Mahur, Amlakhi and Howraghat in the Mikir Hills; Cherrapunji, Mawphlong, Shella, Dawki, Nongstoin, Naya-bunglow, Nongpoh and Baranihat in the Khasi and Jaintia Hills; and Phulbari, Dalu, Baghmara, Siju, Dainadubi, Gabharubandha, Singrimari and Rechu-Belpara in the Garo Hills. It is worth mentioning that Cherrapunji had its urban development even earlier to Shillong, when it was

the capital of Assam. Barapani and Baranihat have their urban potentiality mainly due to the establishment of hydroelectric projects nearby. Sonapahar in the Khasi Hills is growing as a mining town owing to the exploitation of sillimanite deposits.

The Economy

The Meghalaya plateau has a primitive economy even today. Most of the working population (about 80%) have agricultural activities as their primary occupation. The figure is far higher, about 94% for the Western Meghalaya where virtually life begins and ends with working on the vast unproductive tracts. But the region is not at all self-sufficient and has to depend considerably on the neighbouring valley region for the supply of foodgrains. Only a very small section of the people, as mentioned earlier, live on one or the other non-agricultural activities. The region is no doubt rich in mineral resources and water-power potential but measures taken so far for exploitation are unsatisfactory.

A general survey of the region shows that vast tracts are practically unsuitable for agricultural use either due to a rocky and rugged terrain or inaccessibility and, as such, these lie as mere waste and fallow lands. Existence of current fallow tracts is a common phenomenon due to the prevalent shifting cultivation. The area under forests is very low (about 11%). This figure is as low as less than 5% in the Khasi and Jaintia Hills whereas in the Garo and Mikir Hills it is about 10 and 20% respectively. The cropped area in the entire region is only about 5% of the total, though with considerable regional variation : it is about 10% in Western Meghalaya, 5% in the Central and Eastern Meghalaya and about 2.5% in the Mikir Hills. Area sown more than once is insignificant throughout and it is practically nil in the Mikir Hills.

Agriculture : Though most of the tribals practice jhuming, a section of the people follow wet-cultivation in the lowlying areas of the intermontane valleys and some form of terraced cultivation including contour and strip-cropping on the hill slopes. In recent years it is noticed that the

people are taking more interest in the terraced cultivation than in the uneconomic shifting cultivation. In general, the terraced agricultural lands are more conspicuous in the Khasi and Jaintia Hills, whereas Jhuming still dominates the agricultural landscape of Garo and Mikir Hills. It is notable that majority of the people in the Jaintia Hills, unlike the other hill-tribes, are engaged in permanent cultivation. The people both in the Khasi and Jaintia Hills have a comparatively elaborate system of agriculture and take great care to adjust their agriculture to the productive capacity of the soil. They grow rice mainly in the wet lands of the level valley plots and slopes on the plateau, skilfully irrigated in beautiful terraces by indigenous system of irrigation channels which are fed by water from long distances with the advantage of the slope of the terrain in the region. Use of plough is uncommon in the Khasi Hills but the *Jaintias* (also called *Phars*) mostly cultivate their fields by plough drawn by bullocks. This is probably due to the fact that the comparatively low relief and gentler slope in the eastern plateau favours wider and bigger terraces where use of plough is possible in contrast to the strip-like and slopy terraced plots of the central plateau. Further a majority of the *Jaintias*, being Hindus, have been influenced by the Aryan cultural traits, and thus use of plough has become a subsequent cultural tradition.

In the Central Meghalaya, maize, potato, vegetables, chillies, sweet potato, millets, etc., are grown in gardens and in the neighbourhood of the villages, particularly on the higher slopes as subsidiary food crops. A considerable area is also devoted to highland paddy. Besides, cultivation of various kinds of fruits, such as plum, orange, pineapple, lemon, lichi, etc., is successfully done in the Shillong uplands and particularly in the border areas adjoining East Pakistan as well as in the bordering areas of Garo Hills. Areca-nut and *Pan* (betel leaves) are also grown abundantly which at one time, before Partition, provided the people with a flourishing trade in the border areas. The crop-pattern in the Khasi and Jaintia Hills is determined more by the altitude and rainfall than by any other factor.

Out of the net sown area of 160,000 acres (61,538 hectares) in the Khasi and Jaintia Hills, paddy alone occupies 57% followed by potato (15), maize (12.5), arecanut (9) and citrus fruits (6.4). Rest of the area is devoted to minor crops including vegetables. A commercial forest plantation crop which is being experimented within the region is Wattle (*acacia* species) which produces the valuable bark for leather tanning. It grows well, over 900 m elevation, along with potato cultivation.

The principal crop, as also the staple food, in Western Meghalaya like any other region in the Northeast India, is rice. The only areas where the wet method of paddy cultivation can be practised are those lying at foothills alongside the border of Goalpara district and the Rangpur and Mymensing districts (Pakistan). But almost all these strips of fertile loamy soil are practically occupied by immigrant Muslims, whereas the poor tribal Garos live mostly in the hill areas where the soil is poor and the method of cultivation is the primitive *jhum* system. The crop pattern varies from the higher *Jhumlands* to the lower plain strips. In the plain strips, the principal *Kharif* crops grown by the immigrant Muslims are paddy, jute and sugarcane and the principal *Rabi* crops are gram, pulses, mustard, tobacco, potato, sesamum (*sil*) and vegetables. In the *jhum* areas, the principal crops grown by the Garos are 'un-irrigated rice' or highland paddy, cotton, millets, maize, moats, ginger, chillies, betel leaf, pine-apples, tapioca, *Kachu*, banana, turmeric and some summer vegetables. Cashewnut, orange, black pepper, coconut, betelnut, lemon, guava, lichi, mango and jack fruit are also grown throughout the Western Meghalaya region. Indigo and lac are cultivated extensively in this section of Meghalaya but the most important crop next to rice is cotton which provides the Garos an economic advantage over the other hill tribes. Cashewnut and tapioca which are gradually gaining popularity are but of recent introduction in the area. Out of the total net area sown (178,442 acres) rice, millets and other cereals occupy 135,241 acres with rice having 120,770 acres keeping maize to a second position (14,093 acres) among the cereals and millets.

In the Mikir Hills also, rice is the staple food and principal crop and is cultivated widely, though the output is far below the requirements. *Jhum-ing* is widely practised, though with poor yields, and rice occupies the first place as regards acreage of cultivation in the region. The *Mikir*s, however, grow sizeable quantities of maize, pumpkins, cotton, *vams*, ginger, castor plants, etc. The cultivation of castor plants is mainly for feeding the *eri* silk-worms. Lac is also obtained extensively. In recent times, a considerable section of the people have adopted wet cultivation as well as some sort of terraced cultivation particularly in the areas bordering the Nowgong district and the Jaintia Hills.

Livestock : Among the livestock the cattle occupy a significant place with 0.3 million heads in the region and are used as draught animals, and also for milk significantly in the Jaintia Hills and the lowlying areas of Mikir Hills and Garo Hills adjoining the plains both in the north and south. The rearing of cattle for milk by the Garos and Khasis is usually uncommon and cattle are kept only for meat and manure leaving all the milk to the calf. However, at present the educated Garos and Khasis have taken to the use of milk. Rearing of cattle for milk trade has become significantly important in the northern foothills bordering the Assam valley and in the areas around the Shillong town-group and other urban centres by the Nepali graziers. The *Mikir*s and the *Jaintias*, being mostly Hindus, rear the cattle both for agricultural work and milk. Next to cattle, goats and buffaloes have an important place in the livestock of the region. The rearing of buffaloes is less important in the Khasi and Jaintia Hills, but in the Garo and Mikir Hills their number is considerably high. The number of sheep and horses is rather insignificant in the region, but there is a small number of these animals in the higher parts of the Khasi Hills. Poultry is a common household affair.

Forestry : The percentage of reserved forests to total forest area in the region is about 69 but in the Mikir Hills it is over 80, whereas in the western plateau region it is considerably low (33). *Sal* is the principal timber species in the

reserved forests of the Garo Hills and as late as 1965, the year of Indo-Pakistan conflict, it was in log-form exported primarily to East Pakistan after being taken to the Brahmaputra by road. In the form of sleepers, the sawn timber of *sal* is supplied to *Pandu* (Gauhati) to the Eastern Group sleeper control and this region is the second biggest producer of *sal* in the entire area of undivided Assam. The *Dalu* and *Muli* bamboos were earlier exported to East Pakistan and to a less extent to Gauhati. After 1965 these are mainly exported to the Lower Assam Valley. A revenue of more than Rs. 100,000 is derived from the sale of these two bamboo species alone. The *Muli* bamboos which have become reduced in vigour, and hence thinner, are being used for the manufacture of umbrella handles in small industries located in the region. Small quantities of Agar and cane are also produced.

The main sources of forest revenue in the Central Meghalaya-Mikir Hills are timber, lac, and *tecpat*. It may be mentioned here that the pines of the Khasi Hills yield a high quality of resin for production of high grade turpentine oil. But the Government Resin and Turpentine Factory installed at Shillong in 1952-53 began to work at a loss for which it was closed down in 1955. Another commercial forest species of the region is wattle. Honey is also an important forest produce here but it has now become more a produce of cottage industry due to a profitable trade in it.

The richest forest reserve in the Meghalaya is in the Mikir Hills where there are valuable forest produce of timber trees, canes and bamboos and many other minor forest products such as *Patidai*, *Agar*, *Dhuna*, *Chalmugra*, etc., which give very high revenue. Of these, the *sal* and teak are the most important products. The bamboos, and the *Bhelu* trees of the region provide excellent raw materials for manufacture of paper and are exported. The valuable cane species of the region has already drawn the attention of the government and with a view to improving the indigenous cane species, a scheme for planting them has been undertaken in Bokajan area under a Development Scheme since 1955. The species planted

are Wahing (*Calamus viminalis*) and Tita (*Calamus rotang*). The most important drawback which stands in the way of satisfactory exploitation of the forest wealth, as elsewhere in the region, is poor or rather no transportation links with the rich forest areas. However, steps are being taken to overcome this and it is hoped that due to the creation of valuable species and the opening up of means of communications for exploitation of the forest wealth, the future scope of forestry is undoubtedly better for economic gains in the region. One of the most destructive elements in the region against the forest wealth is the shifting cultivation which should be controlled.

Wild Life : Another important resource in the forests of the region is the wild life. The hills in the Western Meghalaya abound games, the larger kind being elephants, tigers, leopards, buffaloes, bears, wild pigs and deers of which the principal varieties are the *Sambar*, the barking deer and the swamp deer. Wild buffaloes are found in the valleys of the Bhujai, the Nitai and the Someswari and the *mithuns* (bisons) are fairly common. Wild elephants in the region very often damage the crops and sometimes cause loss of life. Since 1878, elephants had been captured almost every year (about 190 animals) by the Government Khedda Department.²⁰ The fauna of the Central and Eastern Meghalaya includes elephants, *mithuns*, buffaloes, tigers, bears, probable *Ursus torquatus* and *Ursus malayanus*, wild pig and two varieties of wild dogs—the smaller and larger, presumably *Cyon dukhunesis* and *Cyon rutilans* and four kinds of deer called by the Khasis *Ka sier*, *Ka bthong*, *Ka bhel* and *Ka ske*. The Mikir Hills is famous for the small game. This area, in fact, is the original home of famous rhinoceros. It is pertinent to note that the wild life has been sadly depleted throughout the region. At present, the principal wild animals are only tigers and elephants.

Fishery : Among the four micro-regions of the Meghalaya-Mikir Region, the Easternmost and Western Meghalaya are the most potential ones so far as the fish resource is concerned. The Mikir Hills being overflanked by more or less plain area, particularly in the north-eastern and

north-western sides adjoining Sibsagar and Nowgong districts respectively, have a number of *Beels* and old tanks which may be used for fish production. The variety of fish that can be introduced into these natural fisheries is the 'Indian major Carp'. The Departmental Fish Farms so far developed in this region are Padumpukhuri Renovation Project, Howraghat tank and the Bokajan Tank. But the region with mostly low ranges of hills hardly offers conditions required for hill fisheries. For this reason, the high altitude fish known as the Mirror Carp has been introduced and for this purpose the Shillong Fish Farm has been developed by the Department. The Departmental fish farm so far established in the region are Shillong Fish Farm, Thadlasken Lake and (Jowai), Bhoi-area Fishery Lakes. The reservoir at Umtru has been stocked with fish and will further be developed. The other two proposed reservoirs in this region are one at Umian and the other at Kopili Hydel Project. The number of such natural fisheries has been given as 31 in the Garo region. Almost all kinds of fish including many of the plain types are found in these fisheries.

Minerals and Industries : The region is very rich in mineral resources, but so far only coal, limestone and sillimanite have to some extent been commercially exploited. The important minerals of the region are :

(i) Upper Cretaceous and Lower Tertiary coal in Garo, Khasi, and Mikir Hills; (ii) High grade nummulitic limestone, in a belt extending from Garo Hills in the west through the Khasi-Jaintia-Mikir Hills in the east; (iii) Sillimanite and corundum deposits in Sonapahar area of Khasi Hills; (iv) Clays, including kaolin or 'China-clay' in the Garo (Tura area), Khasi (Mawphlong area), Jaintia and Mikir Hills, the Garo Hills alone having more than 35 million tons of recoverable clay comprising a fine quality of white clay or kaolin and occurring in as many as ten places, well exposed near Tura, Deranggiri, and Damalgiri along the southern slopes of the Tura Range and are quite suitable for manufacture of white wares and ceramic products like stoneware pipes, sanitary ware, glazed tiles and bricks; (v) Glass sands in

the coalfields of the Laitryngew and Cherrapunji areas in the Khasi Hills; (vi) Banded-iron ore in the border areas of the Khasi-Jaintia hills and the Assam valley; (vii) Copper, in the Umpyrtha and Ranighat areas in the Khasi and Jaintia Hills; (viii) Gold-bearing rock with a trace of 1.2 penny weight of gold per ton of rock, southwest of Mawphlong in the Khasi Hills; and (ix) Gypsum in the form of Sebenite crystals and disseminated in shale beds, near Mahendraganj in the Garo Hills and in some places in the Mikir Hills.

Regarding regional distribution of the said potentially rich mineral wealth, it may be noted that the Central Meghalaya plateau not only has the greatest concentration of minerals but has accounted for a high regional income from mining in the Meghalaya. This section of the Meghalaya produces more than 90% of the total sillimanite of India which is mined in and around the recently established mining centre of Sonapahar, about 3 km north of Nongmawet in the northern part of the Nongstoin State of the Khasi Hills, from 13 deposits, in a belt, 20 km long and 1.5 km wide. Reserves of this natural refractory, world-famous from the point of view of quantity and purity and for occurrence in the form of massive rocks from which blocks can be sawn for direct use in furnaces, have been estimated at about 0.5 million tonnes. Corundum, another valuable mineral, is found to occur in association with the sillimanite deposits. Low grade 'quartz-sillimanite schists' also occur in the same area, in and around Sonapahar, and the reserves may run into a few million tonnes.²⁵ The extraction of sillimanite continued to expand in recent years and reached 10,819 tonnes in 1964 from 8,255 tonnes in 1962. The current level of production does not cope with the foreign-export demand and as a result bulk of the sillimanite has to be exported in raw form to foreign countries mainly to Germany and Belgium. Though the production came down to 10,386 tonnes in 1965 and to 9,929 tonnes in 1966, the value in rupees has increased to 813,000 and 3,164,000 respectively from 560,000 rupees in 1964.²⁶

It is in the Central Meghalaya region, that coal

has been exploited to a great extent although there are vast reserves in the Garo and the Jaintia Hills. However, the coal production in the Meghalaya region has a dwindling trend (from 0.22 mill. tons in 1961 to 0.09 mill. tons in 1965). The estimated reserves of workable coal in the important coal-bearing areas of the plateau are, Garo Hills—242 mill. tons, Khasi & Jaintia Hills—152 mill. tons, and Mikir Hills—3.6 mill. tons.

The exploitation of nummulitic limestone is also very significant in the region. Deposits of high grade limestone with certain bands having up to 98.5% CaCO_3 , occur extensively. The best exposures occur in Jowai area in eastern Meghalaya, extending continuously for more than 22 km. From the earliest days trading in lime, which has great value for building purposes and also as an insecticide, has been a prosperous business between the Khasi Hills and the Sylhet region, now in Pakistan. Earlier, limestone used to be quarried at the foot of the Khasi Hills between Theriaghat and Shella and the Cherrapunji area and production used to be transported by country-boats to Chhatak, now in East Pakistan, where the limestone is burnt in kilns to produce what was once famously known as "Chhatak lime". Quite a large quantity of this highgrade limestone was also exported to East Pakistan to feed the cement factory at Chhatak but after September, 1965 the export has been stopped. Now, the bulk of limestone is being utilized in the Cement Factory at Cherrapunji.

Though not exploited, the best reserve of purer limestone is found in the Western Meghalaya in the Siju limestone stage of the Jaintia series of Eocene age. The bed stretches along the entire length of the Garo Hills from Pandengru on the east to Damalgiri on the west. In the Mikir Hills good quality limestone occurs in the rock of Sylhet limestone stage at Garampani, Koilajan and Longlai areas, which, it is reported, is highly suitable for cement manufacture due to low magnesia content. It is learnt that the proposed Bokajan Cement Factory of the Mikir Hills will be fed by the rich limestone deposits of the locality.

Regarding production of limestone, the only area exploited, not only in the Meghalaya but even

in the whole of undivided Assam, is the southern section of the Central Meghalaya. The production figures have fallen from 954,000 tons in 1956 to 30,000 tons in 1966.

Pottery and glass-making materials also abound in the Cherrapunji area in the Cherra sandstone group of rocks and in the Tura area where the light-coloured sandstone when powdered gives excellent glass-sand suitable for manufacture of sheet glass and flint glass. The friable quartzite of the Shillong series is also a valuable mineral for glass-making. Further, there are rich deposits of fire-clay in the lower Eocene coal seams of Central Meghalaya and also huge quantities of building materials such as gneisses, schists, quartzites and shales all over the Region. Apart from the limited mining activity, there are some cottage industries and the only cement factory (daily output 250 tons) in the Cherrapunji area.

In the Western Meghalaya there are only a very few primitive cottage industries such as weaving of coarse cloth from the locally available cotton, making of bamboo and cane baskets and other cane work, dugouts of wood and making of country-boats, extraction of lac and fashioning of rudimentary implements of metal. A thermal power station has been set up recently at Nangalbibra near the Khasi Hills border because of the economically important coal reserves nearby. Manufacture of a sizeable quantity of coke from the Cherrapunji and Laitryngew coal has been satisfactory and is now being sent to Shillong from the coal producing areas for use as cooking fuel.

Considerable development has been achieved in implementation of hydel projects as a result of harnessing the water-power potential in the Central Meghalaya. The two spectacular developments in this regard are the construction of the Umtru and the Umiyam (Barapani) hydel projects. A third project is under implementation in the Khasi and Jaintia Hills to be known as the Kopili River Valley Project which will greatly benefit the eastern and Mikir Hills regions in their northern sections and also the southern part of the Central Assam Valley. In addition, a small Meter Factory has been set up in Shillong with the colla-

boration of the G. E. C. India Limited. The factory has already started producing meters and it employs about 400 persons, majority being educated women of the Shillong area.

The Mikir Hills, like the Western Meghalaya, is also industrially a blank region except the recently established cement factory at Bokajan, some coal mining activities at Koilajan and a variety of cottage industries. The Mikir women-folk are known to be good weavers of cotton and *endi* cloth. Weaving of coarse, sometimes fine, *endi* fabrics is a good cottage industry for the Mikirs. They raise cocoons of the *Attacus ricini* in the gardens of castor plants. They also dye their own yarns in fast colours prepared out of raw indigo and other locally available herbs. Since 1951, the Government has established a Demonstration Silk Farm at Diphu for training the women-folk in improved and modern methods of weaving. Another important cottage industry is blacksmithy and almost each and every village has at least one blacksmith's workshop where various kinds of spade-hoes, knives, spears, fishing hooks, axes and *daos* are made for sale to the village-folk. Basketry and mat-making are also important cottage industries.

Transport and Communication

Lack of transport and communication facilities is the main limiting factor in the development of the Region. During the British period and after Independence some important roads were constructed mainly for the administrative convenience. The development of roads as a measure of social welfare is yet to take place in the region and there are practically no railways except a small portion of North-East Frontier Railway crossing the Mikir Hills area. The development of roads and railways has, of course, special difficulties on account of the existence of numerous ranges of hills of varying heights, torrential rivers and streams which have been changing courses requiring considerable extent of bridging, circuiting of roads due to steep slopes and gorges etc. But even then, the development that could be done, inspite of the physical handicaps, is far from satisfactory, except, of course, a few good roads

in the Central and Eastern Meghalaya plateau. More than 80% of the villages are situated away from the jeepable road, being connected by feeder roads only, many of which are no better than foot tracks. The markets where transactions are usually made by the people are situated at quite a distance which makes the cost of transport unduly high.²⁷ It is also significant to note that the Partition of India cut off communications between Garo Hills and the southern part of Assam with the Assam Valley and thereby caused a great setback in the communication links between Western Meghalaya and the rest of North-east India. In order to deal with this extraordinary situation, construction of Shillong-Jowai-Haflong-Silchar road and Medhipara-Phulbari-Tura road was undertaken. Further, the construction of the Shillong-Jowai-Passi-Badarpur road was considered to be of particular importance to provide a link with Tripura and the southern part of Assam. The major part of the road from Shillong to Badarpur, 210 km in length, has been completed.²⁸

The Central and Eastern Meghalaya only have some good roads, the most important being the Gauhati-Shillong (N. H. 40), the Shillong-Dawki and the Shillong-Cherrapunji roads. Shillong-Gauhati road has now been developed into two-way lane. The Shillong-Balet road and Shillong-Mairang road are also worth mentioning because they have linked up the hitherto inaccessible areas of the district. Another road has been constructed from Jowai to Dawki, and yet another is being constructed from Jowai towards Nowgong district. Arterial roads are also being made throughout the district. At present this region has 306 km of black-topped or surface road, 200 km of metalled road, 296 km of gravelled road, 238 km of earth road, 382 km of bridle path, the total road being about 1,422 km. The total length of village roads, 89 in number, is 736 km.

The Western Meghalaya has only 31 km of blacktopped road, 422 km of gravelled road, 62 km of earth road, 14 km of bridle path, the total road being 735 km. The total length of village roads, 129 in number is, 1,422 km.

In the Easternmost Meghalaya the Numaligarh-

Dimapur N. H. 39, is the single most important road. The only other road of some importance is the Garampani-Dolia section of the Shillong-Silchar Road. The region has only 7 km of black-topped road, 159 km of gravel road, 83 km of earth road and 27 km of bridle path, the total length being 276 km. It has, however, a large number of village roads, with a total length of about 2,000 km. In addition, a section of the N. F. Railway, 77 km, passes through this region of which Diphu is the most important railway station. Another branch line from Lumding also passes through the south-western part of this micro-region which connects Badarpur in Cachar through Haflong.

The internal waterways in the region are not important and only Simsang and Krishna in the Western Meghalaya, Jamuna, Diyung and Kapili in the Mikir Hills and Digaru and Borapani in the Central Meghalaya are navigable in their lower reaches for small boats during the rainy season. Recently an airstrip has been opened at Shillong mainly to connect Gauhati by air. There is a proposal for the construction of a ropeway from Shella to Shillong via Cherrapunji and thence to Pandu in the Kamrup district. The Central Government has assigned top priority to road development in this region and works have already been started on construction of 531 km of road in the Garo and Khasi and Jaintia Hills districts along the border in Assam-East Pakistan region. Improvements have also been carried out in the National Highways of the region.²⁹ But more attention is necessary to develop a considerable number of roads so as to connect the interior areas with the main urban centres and market places. The building up of an improved all-weather dependable road suitable for two-way traffic to link the three headquarters of Shillong, Jowai and Tura is of urgent necessity both for administrative convenience as well as for social welfare. The proposed rope-way between Cherrapunji and Pandu and the railway line from Tura to Gauhati via Phulbari also need immediate construction to facilitate movement of mining and forest materials on the one hand and to ease the transport bottleneck between Western Meghalaya and Gauhati on the other.

The Regions

The physiographic characteristics of the Region are remarkable due to the hilly and dissected terrain in the western and northern faces in contrast to the regular and steep fall of most of the southern faces. Most part of the region is socio-economically less known. However, the Garos, the Khasis, the Jaintias and the Mikirs, the main culture groups, though intermixed to some extent spatially, are well-set in their respective occupancy areas. Based on broad and generalised aspects, the Meghalaya-Mikir Region has been divided into three first order, seven second order and fourteen third order regions (Fig. 18.3).

Regional Scheme

XVII. Meghalaya-Mikir Region

35. Meghalaya-Mikir Region West

- (a) Garo Region North
 - (i) Rongmachokgiri-Rongchugiri Region
 - (ii) Krishnai-Dudhani Basin
- (b) Garo Region South
 - (i) Tura-Dalu Region
 - (ii) Someswari Basin

36. Meghalaya-Mikir Region Central

- (c) Khasi Region North
 - (i) Patharkhnang-Rambrai Region
 - (ii) Loharghat-Nongpoh Region
- (d) Khasi Region South
 - (i) Jadukata Basin
 - (ii) Shillong-Cherrapunji Region

37. Meghalaya-Mikir Region East

- (e) Jaintia Region
 - (i) Jaintia Region, West (Jowai Region)
 - (ii) Jaintia Region East
- (f) Mikir Region West
 - (i) Mynser-Hong Habai Region
 - (ii) Diyung Basin
- (g) Mikir Region East
 - (i) Diphu Region
 - (ii) Mikir Plateau

Meghalaya-Mikir Region West

The region covers most parts of the Garo Hills and is separated from the Meghalaya-Mikir Region Central by the Moheskhol Adaguri range. The region is divided into (a) Garo Region North and (b) Garo Region South, by the Central range (Tura range). Most of the parts



Fig. 18.3

of the *Rongmichokgiri-Rongchugiri* region have comparatively lower and gentler topography, sloping towards the Brahmaputra Valley and hence fertile and densely populated. The *Krishnai-Dudhani basin* is highly dissected and hence the settlements are confined to only lower parts of the valley. The *Tura-Dalu region*, lying in the Garo Region South, is well linked with the northern and southern parts of the region. Tura (8,888; 1961) is the only urban centre of the region. Population is highly concentrated in the southern and western margins, following the foothill zone with a density of 200-300 persons per km². Most of the upper part of the *Someswari basin* is densely forested but agriculture is well practised in the south.

Meghalaya-Mikir Region Central

The region covers most of the parts of the Shillong plateau and hence forms the highest peneplaned surface. The Shillong peak (1,961 m) is the highest in the area, located just south of Shillong proper. The region is divided into (c) *Khasi region north* and (d) *Khasi region south* by the central ridge. The Khasi region north is further divided into two third order regions mainly on the basis of physiography. The *Patharkhnang Rambrai region* is confined to above 900 m elevation and is forested, while the *Lobarghat-Nongpoh region* is comparatively on the lower altitudes though highly dissected. The Khiri and the Digru drain the regions from south and north respectively. The *Jadukata basin*, in the Khasi Region South, is drained to the south. The *Shillong-Cherrapunji region* is the most developed in the Region. Shillong is the capital of Assam, and along with its satellite towns is the only urbanised zone of the Region. Cherrapunji is the rainiest spot located here. The region is famous for growing varieties of fruits, such as pine-apple, banana, orange etc. The region is well-connected with Gauhati by a first class road.

Meghalaya-Mikir Region East

This region has been divided into (e) *Jaintia Region*, (f) *Mikir Region West*, and (g) *Mikir Region East*. The two divisions of the Jaintia

region are (i) *Jaintia region west* and (ii) *Jaintia region east*. The western part of the Jaintia region or Jowai region is relatively more developed than the Jaintia region east. Jowai (1961 pop. 6,197) is the only service centre of the region and is connected by road with Shillong in the west and Sylhet via Jaintiapur in the south. Most parts of the eastern Jaintia region are unfamiliar and lying vacant.

The 900 m contour roughly separates the Mikir region from the Jaintia region in the west and southwest. The region is partly isolated being surrounded by the plains on three sides and is connected with the Jaintia region through a patch of highly denuded and subdued senile terrain. The region has roughly a northerly slope, but in the centre of the plateau there has developed a gently low-lying area through which the Jamuna, a tributary of the Kopili, crosses the plateau E-W and thus, two distinct regions are well-marked in the Mikir region east : (i) *Diphu region* and (ii) *Mikir plateau or Chengheishon plateau*. The Diphu region is well connected by railway running north-south and east-west. Diphu is an important service centre of the region and is connected by rail with Lumding, Dimapur (Assam Valley) and Haflong. The Mikir plateau is almost surrounded by the Assam valley. The average elevation of the region is about 1,000 m. The lower slopes facing the Assam valley are, of course, well developed.

Problems and Prospects

At present the region has many problems though the potentialities are rich. The formation of the Autonomous Hill State of Meghalaya, comprising the Garo, Khasi and Jaintia hills in April, 1970, reflects a distinct realization of the regional personality. This may bring in a real start to the industrial, urban and socio-economic development of the region in an integrated way. Mikir Hills region may be associated with the various development plans of Meghalaya for industrial benefit.

There is limited scope for extension of agricultural land owing to the rugged terrain and the predominance of *Jhuming* cultivation which is

both uneconomic and harmful to the land resource and forest wealth. The effective measures, if taken to persuade the people to practise more extensively the profitable and scientific terraced cultivation will undoubtedly go a long way in enhancing the agricultural output in the region.

It will be worthwhile to mention that the Region in its easternmost sector is very rich in raw materials for establishment of a Paper and Pulp industry near Diphu. The proposed Bokajan Cement Factory (under construction) will undoubtedly add significantly to the industrial economy of the region based on the high-grade locally available limestone and coal. The Siju area in the Simsang valley of the Western Meghalaya needs proper attention because it is a remarkable site for a Cement Factory owing to the available high-grade limestone with 98.5% CaCO_3 and rich reserves of coal.³⁰ Proper exploitation of the minerals, as mentioned earlier, with the construction of good transport and communication lines will undoubtedly add a number of mineral and forest-

based industries in the Region and it is quite likely, if steps are taken, that the Simsang Valley of the Garo Hills may come out as an important industrial region in the Northeast India. In the whole of Meghalaya a number of industries making use of the forest wealth may profitably come up and this may add significantly to the industrial economy of the Region.

There is ample scope for the development of fisheries, particularly of the Mirror carp type. The proposed reservoirs at Umiam and Kopili will set instances of such development. The region has huge water-power potential. The two spectacular developments in this regard are the construction of the Umtru and the Umiam (Barapani) hydel projects and a third underway is the Kopili River Valley Project, which will greatly benefit the eastern region, particularly in its northern sections and also the southern part of the Central Assam Valley. Thus the Meghalaya-Mikir Region is a land of promise for consolidating development programme of North Eastern India.

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In the scheme of geographical regionalization of India Maharashtra stands out as a large but fairly homogeneous region ($15^{\circ}44'-21^{\circ}40'$ N and $73^{\circ}15'-80^{\circ}33'$ E). The homogeneity of the region manifests itself in both, the physical and cultural traits. Practically, the entire region rests on a basaltic base which is, at places, tectonically dis-

turbed, eroded and buried beneath a mantle of alluvium. The basaltic base with its structural peculiarities and the familiar spheroidal weathering has evolved into a landscape which is characterized by mesas at variable altitudes and the wide open valleys in which the present rivers appear like misfit streams. More significant than



Fig. 19.1

the physiographic homogeneity is the cultural identity that prevails over the region. Maharashtra, also sometimes called, the land of Marathas, is a very distinct cultural region because of the identity of language, a typical social organization based on the village as an economic unit and the robust historical traditions for which the Marathas are known. Irrespective of castes and professions the Maharashtrians are forged into a society which speaks a common language, finds a unifying force in its recent history, in the glory of the Maratha rule, and above all in Shivaji who brought the conflicting elements of the Maharashtrian society together welding them into a formidable force.

A linguistic group occupying a contiguous region is what has made Maharashtra a recognizable identity with its components exhibiting varying aspects of physical environments which often present a contrast, but all integrated together by a common language and a common history (Fig. 19.1).

Historical Background

Maharashtra as is known today was a part of the Ashokan empire and was not very popular till the first or second century A. D. The region witnessed a well-organized administration in the second century A. D. when it was ruled by the Salivahanas from their capital at Paithan. Through a succession of dynasties, viz., the Salivahanas, Vakatas, Rastrakutas, Chalukyas and the Yadavas, the administration of the area passed into the hands of the Muslims in the early 14th century who ruled it from Delhi. Distance always created a barrier, and the short-lived administration of Delhi was overthrown and a new Muslim dynasty called the Bahmani dynasty was established in the Deccan. The Bahmani empire disintegrated at the close of the 15th century, and the fall of the sultanate in the South saw the emergence of the Maratha power, which with all its ups and downs continued till the end of the 18th century when the Marathas were finally defeated and the region passed into the hands of the British with the rest of India.

The Physical Setting

Geology and Structure

Much of the region except the eastern part of Wardha-Wainganga basin and a small littoral patch in Ratnagiri is underlain by basaltic rocks. In the Wardha-Wainganga basin are exposed some of the earliest known rocks of the earth. The schistose gneisses of the Archaean with an island of archaean granite and flanked by Dharwarian schists are the principal formations. The gneiss-granite complex of Archaeans have accumulated in their tectonic depressions the sediments later metamorphosed into Dharwarian rocks. There are occasional patches of Cuddappahs and Vindhyan; the latter, however, are highly localized and not very significant. The rest of the region has a basaltic base, on which there are alluvial deposits in the river valleys, on the terraces and the old flood plains. All these deposits are related to fluvial action and are not older than the early Pleistocene.

The extensive basaltic sheet which has a thickness of more than 2,000 m in western India has resulted from the consolidation of the lava that erupted sub-aerially¹ during the late Cretaceous and early Eocene. Bulk of the trap, however, erupted in the early Eocene about 60 to 65 million years ago. The principal element in the lithological complex of the region is the basaltic plateau which disturbed by diastrophic movement and subjected to sub-aerial processes has produced a multitude of microforms. The most striking feature in the landform assemblage of the plateau is the 1,000 m fault escarpment that forms its western margin. The post-Trappean fault possibly associated with the continental drift appears to have occurred during the Eocene giving rise to the present shore line of the Arabian Sea. The subsequent recession of the escarpment has produced the Konkan lowland. While the Konkan lowland has been influenced by the erosion and sedimentation of the coastal rivers and the eustatic changes of the sea-level, the plateau after the catastrophic phase of faulting has remained relatively stable and has undergone a succession of cycles of erosion.

The landforms produced, therefore, are essentially climogenetic. Climate has assumed an important role in landscape evolution particularly because of the sharp decline in the amount of rainfall from the crestline eastwards. The western margin of the plateau in which are preserved the relicts of the original plateau and the ancient surfaces of erosion is known as the Sahyadri. With its peaks and plateaus often covered with lateritic red soil and localised patches of dense forest, the Sahyadri is a narrow crest zone of the divide with a width of 15 to 25 km. It is sometimes difficult to distinguish the Deccan plateau from the Sahyadri particularly in sectors where the westward extension of the surfaces of erosion reach the crestline, thus, developing a saddle in the difficult terrain. It is significant that most of the *Ghats* in the Sahyadri occur at an altitude of 600 to 700 m A. S. L.

Eastward from the Ghats the landscape is characterized by broad valleys divided by flat-topped interfluvies, the mesas overlooking the valleys and separated from them by precipitous rectilinear escarpments, the foot zones of which are topographically a pediment buried beneath the debris of slope, a 'glacis d'accumulation', which imperceptibly merges with the terraces. The major interfluvies of the plateau rise westwards in steps, the ideal 'Piedmont Trappean', and represent erosional surfaces. Away from the Ghats eastwards, a sudden drop in the amount of rainfall has fostered aridity and the development of a general inselberg type of landscape. Further east, the block-like flat interfluvies gradually narrow down and finally disappear giving rise to broad alluvial plains covered with black soil. But for occasional buttes which interrupt the monotony of the landscape the area is a vast stretch of black cotton soil.

The Tapi (Tapti) basin in the north is an asymmetrical valley with a gentle southern slope and an abrupt rise to the north in the Satpura hills. The area is noted for its abundance of dykes

which have influenced the courses of many tributary streams. The general height of the basin is 200-300 m above sea level in contrast to 400-600 m of the plateau drained by the Godavari and the Krishna. The Wardha-Wainganga plain, however, is the lowest part of the region. Proximity to the sea and a higher amount of rainfall have helped a quicker reduction of the land and the evolution of a lowland relief with a general height of 150-250 m (Fig. 19.2).

Topographically then, the Maharashtra region has 4 principal units, the Sahyadri, the Plateau proper, the Tapi basin and the Wardha-Wainganga plain.

Drainage

The entire region is drained by three principal river systems, the Tapi, the Godavari and the Krishna. Except the Tapi-basin, which is drained to the Arabian Sea, the rest of the region is drained to the Bay of Bengal. More than half the area is covered by the Godavari basin, one fifth by the Tapi, and the remaining by the Krishna. The principal component of the region, the plateau of Maharashtra is drained by the Godavari in the north and the Krishna and its tributaries in the south, the two systems divided by Balaghat plateau. The drainage networks of both the rivers, Godavari and Krishna present an ideal dendritic pattern, a result of uniform lithology and inadequate structural control. The rivers are graded almost to their source; the grading, however, is not related to sea-level but to the crystalline girdle around the basaltic plateau; the former being relatively more resistant, exercises a virtual base level control.

Evolution of the Drainage : One does not know the details of the pre-Trappean hydrology but it is quite likely, as indicated by a progressive westward increase in the thickness of the trap rock, that the pre-trappean drainage of Maharashtra plateau was westward which was buried subsequently under the cover of lava that developed an easterly slope on which the present drainage was initiated. The general north-west south-east orientation of the drainage is the function of maximum slope component on the plateau deter-

* The word 'Ghat' literally means steps along a river or a lake, but the word is locally used for a saddle or even for the mountains in general.

mined largely by the shortest distance between the source of the rivers and the sea. The larger tributaries, developed obliquely to the main streams and indenting deeply into major divides, have eroded the latter making them irregular and dissected. Most of the rivers emerging from the heavy rainfall Sahyadrian zone pass through semi-arid tracts and are thus exoreic in nature. They flow in broad open valleys which do not seem to have any relation with the streams. In fact most of the rivers are underfit in their valleys. The graded longitudinal profiles of practically all rivers are interrupted by knick points which sometimes occur in groups, one above the other, suggesting a relative stability of the knick points in the source

region. This has its effect in the step-like arrangement of hardly recognizable narrow surfaces of erosion retained on the interfluvies.

Almost all the rivers are in a phase of incision exhibiting on their banks, sections of terraces or alluvial deposits. These rivers are, however, not equally active. Those which possess considerable erosive capacity are the ones descending transversely from the flat-topped mesas, the interfluvies, over the precipitous slope to join the main rivers. Often they capture the headquarters of some major tributaries traversing the entire length of the plateau, leaving an underfit valley below the point of capture. A typical example of this phenomenon is the Manjra river flowing

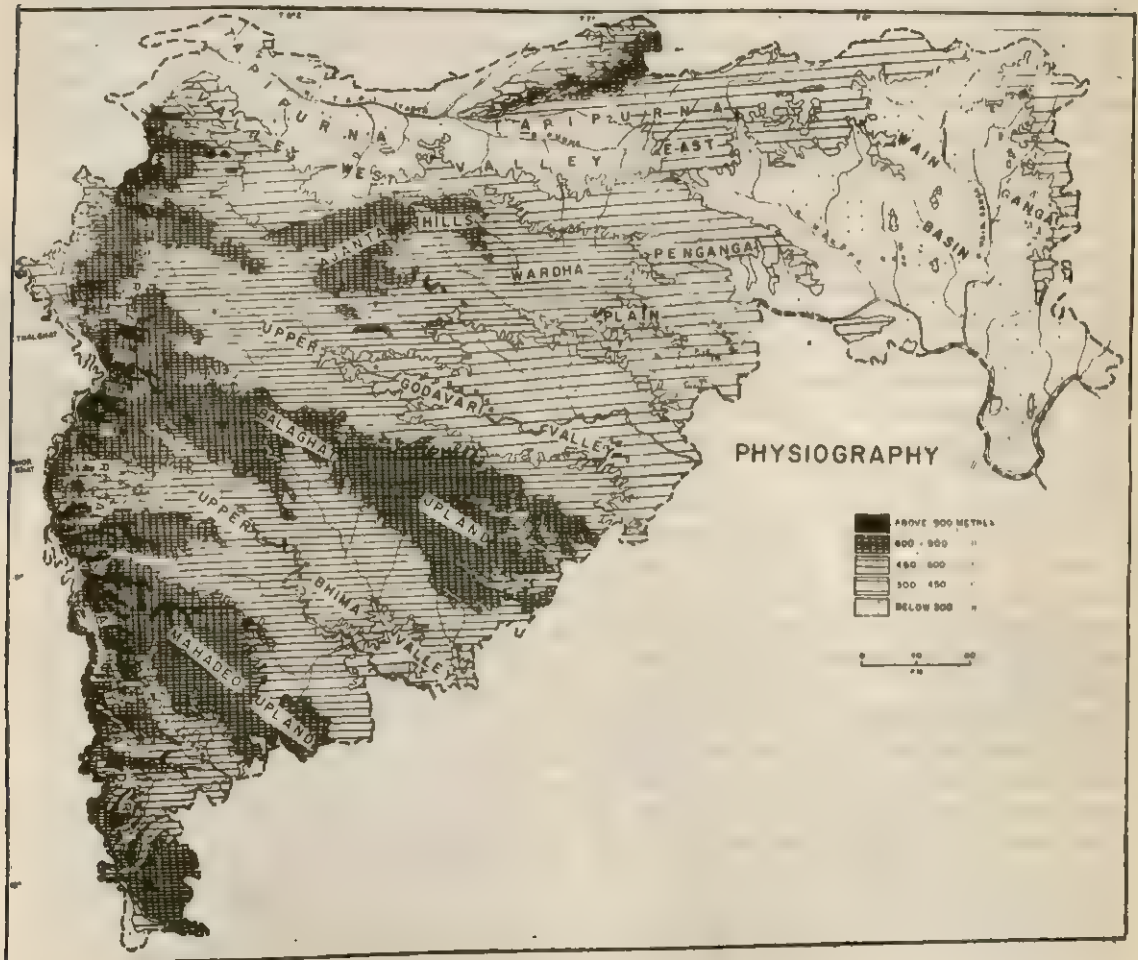


Fig. 19.2

over the plateau of Balaghat and captured by a tributary of the Godavari near Hyderabad.

In the history of drainage evolution, the Tapi valley is a late addition. It seems that part of the Tapi basin particularly some of its lower parts were included in the catchment of Godavari. Consequent upon faulting which produced the Tapi through, many of the tributaries in the source region of the Godavari were diverted northward. The fast eroding tributaries of the Tapi moving over a steep gradient captured many of the tributaries of the Godavari. One finds definite evidence of such diversion in the direction of the tributaries joining the Tapi from south. Most of them are sub-parallel to Godavari in their upper courses before turning north over an elbow point. Their lower courses are still traceable in the tributaries of the Godavari, separated from the upper courses by the windgap at Nandgaon. Many of the tributaries of the Tapi joining from south show an asymmetrical cross profile and a parallel northward shifting.

The integrated drainage of the region, though firmly entrenched, with the principal rivers graded almost to their source, the cycle has not advanced beyond maturity.² It has to be emphasized here that the drainage texture in the Maharashtra plateau is considerably influenced by sharp regional variations in rainfall. While in the Sahyadri region the drainage network is fairly closely spaced, tributary development is retarded in the semi-arid eastern part, the reason why flat interfluvies are still preserved. The accumulated discharge in the lower parts of the principal streams and their main tributaries on their graded profiles has led to the coalescence of the flood plains, and the formation of large alluvial tracts.

Most of the rivers in the region have terraces on their sides, and the larger ones often present thick alluvial sections. The flood plains of the Wardha and the Wainganga present an aspect of senility while the relief in Tapi basin has not transgressed maturity. Some of the rivers originating from Sahyadri are dammed converting their re-entrants into reservoirs used for irrigation or generation of electricity.

Climate

The region being fairly large, climatic contrasts particularly the variations in the amount of rainfall are obvious. With a limited latitudinal extent and a not so very pronounced vertical range of altitude, the temperature conditions do not change significantly. The western margin of the plateau, being closer to the sea, is less continental and presents a comparatively low annual range of temperature. In winter, while the maximum temperature in all parts varies between 30 and 35°C, the minimum shows significant variations. The places away from the coast and thus from the Sahyadri show decreasing minima. Night temperatures are the main elements which make the winters more severe in central and eastern parts. In summers, while the western parts show a moderate heating, an effect of altitude and nearness to sea, the places deep inside the land and those remote from the maritime influences and at comparatively lower altitudes, show higher temperatures. In contrast to diurnal heating in these parts the cooling in the night is slow. The result is a virtually uniform daily range over much of the plateau though higher temperatures both during the day and the night prevail in Middle Godavari and Wardha-Wainganga valleys.

The rains in Maharashtra are largely confined to a five month period from June to October, owing largely to Summer monsoons, though some rain is received during the retreat of S. W. monsoon associated with cyclonic storms in early winter. A large part of the plateau receives less than 1,000 mm of rainfall; the Sahyadri on the west and the Wardha-Wainganga basin on the east are the exceptions. The crest zone of Sahyadri about 25 km wide, is the belt of heaviest rainfall. Igatpuri (3,341 mm) Lonavala (4,396 mm), Khandala (4,705 mm), Mahabaleshwar (6,226 mm), and Amboli (7,477 mm),—all located near the crest line of the Sahyadri receive heavy rainfall. From the crestline over a distance of hardly 40 km, one notices a sharp fall in the amount of rainfall. Thus, Nasik (834 mm), Junnar (742 mm), Wai (710 mm) and Karad (713 mm), all in the rain-shadow of the Sahyadri and not far from its crest receive scanty rains. The driest parts of Maha-

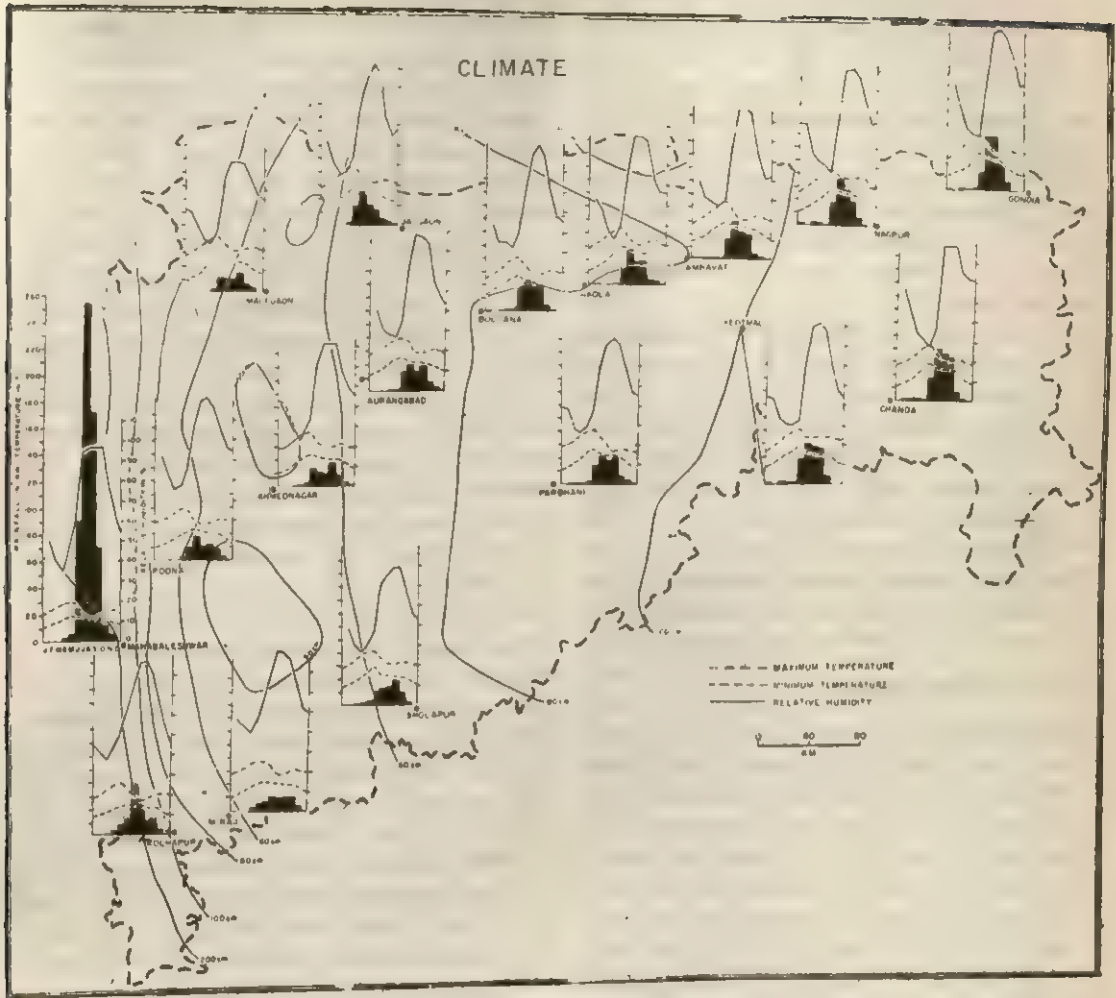


Fig. 19.3

Maharashtra lie in a north-south belt, passing over Sangamner, Baramati, Dhond and Jejuri. Further south, the plateau of Aundh and the district of Sangli also occur in the rain shadow. This dry core of the region suffers from frequent droughts and low agricultural productivity. Further east, there is a progressive increase in the amount of annual rainfall that changes the landscape and the cropping pattern in eastern Maharashtra, the Wardha-Wainganga basin (Fig. 19.3).

Over a large part of the region the S. W. monsoon bursts about the 10th of June. In Nagpur region the monsoon breaks almost at the same

time as on the Konkan coast. This appears anomalous as the eastern part being away from the sea should have the onset of the summer monsoons later. This is accounted for by the instability conditions in the heart of the country combined with the incursions of monsoon air from both the seas.³

The summer monsoon in Maharashtra region lasts for over 4 months. Unlike the burst of the monsoon its recession is a slow process, but it is rather complete by 15th of Oct. The total duration of rainfall is 140 days for Central Maharashtra though the period of effective rainfall does not

displays a few well-developed horizons resting on *maurus*, the waste product of mechanical disintegration of the trap rock. In higher rainfall area, the chemical decay of trap rocks gives rise to red clay, so typical of Sahyadrian zone, noticed on the bare mountain slopes and seen in the muddy ochre-colour flood waters of the tributaries. The soils in the valleys are darker, deeper and more fertile. They have the advantage of river transport which besides grading down the texture, brings fresh deposit of alluvium every year. The best black soils of the region occur in Tapi, lower Godavari and Krishna valleys. The thick mantle of transported soils in these valleys supports the cultivation of wheat, cotton and sugarcane. Depending on the thickness and the colour intensity, one may recognize deep black, medium black and light black soils. While the deep black soils are confined to the valleys, the medium black soils, the most widespread in the region, occur on the interfluvies and the light black soils are found on the hill slopes in less rainy areas. The typical black soils are highly argillaceous. When wet they become very sticky. The fertility of this soil depends largely on the topography. The soils of the upland are lighter and less productive, but those in the valleys are deeper, richer and darker.

Lateritic soils are confined to a narrow Sahyadrian zone. The typical lateritic soil occurs in Kolhapur and Satara districts and continues down the Ghats in the Konkan. The soils are poor in organic matter. With a pH varying between 5.5 and 6.5, the lateritic soils are often covered with forests or orchards. In Kolhapur district the cashewnut orchards grow well in this soil. Besides the hill slopes and dissected terrains on the plateau, some parts of Maharashtra region carry skeletal soils which are not at all fertile.

The Cultural Setting

Population

The region is inhabited by more than 4 million (30.862 millions in 1961) people who are distinguished by their allegiance to a social group, a particular religion or the profession they hold.

A large section of this population, recognized as Maharashtrians, speaks Marathi which is the language of the region and the mother tongue of the majority of the population. The non-Marathi speaking population is confined to industrial towns and medium-size service centres. It may include the Muslims who speak 'Urdu' and the petty traders, often the Marwaris and the Gujaratis who are not yet assimilated in the Maharashtrian society and follow their own traditions and customs. The transitional zone on the northern and eastern margins of the region has a fair percentage of Hindi speaking people who are not of Maharashtrian origin, but may be as native of the region as the Marathi speaking people.

Among the Maharashtrians, there are groups and sub-groups based on castes, professions and the place of their origin. Ethnically, there are hardly any traces of Negroid and Mongoloid elements and the region consists essentially of the Australoid Europoid people.⁶ Apart from the economic stratification which is universal, caste is an important criterion that determines the social group and the status of individuals.

The most numerous and commanding over half the population of the region are the Marathas and the Kunbis, both of which claim to be 'Kshatriyas'. The Marathas today are largely the owners and cultivators of land. Many of the ruling houses in Maharashtra including Shivaji belonged to this caste. Noted for their warrior-like qualities the Marathas still dominate the area with their supremacy over land and the politics of the region. The Brahmins with numerous ramifications, but largely represented by the two regional groups, the 'Deshasthas', the natives of the plateau region, and 'Konkanasthas', the immigrants from Konkan, are a class of intellectuals who spearheaded the independence movement and provided social and academic leadership to the region. Another group, numerically not very significant is that of 'Kayasthas', called also the CKPs. They are largely confined to big cities, particularly Poona and Bombay but some live in Maval region where they held 'Inam' lands. A progressive community, they are traditional

writers who excelled as revenue officers during the Maratha regime.

Thus, the Marathas and the Brahmins form the two strong wings of the society, in which other castes are still underprivileged. Between the Brahmins and Marathas on the one hand, and the Malhars, and Mangs on the other, is the most inclusive group of artisans 'the *Balutedars*', which represents a transition on the scale of caste hierarchy.

The trend of population growth : The region has shown a consistent growth of population from the beginning of the century except in the early twenties when unstable conditions prevailed over Deccan because of famine and the influenza epidemic which ravaged much of Western India. The decennial increase of population has varied from 10 to over 20 percent with a maximum of about 24 percent between 1951-61. Generally the areas with a low population density have a lower increase suggesting the adverse effect of the poverty of the terrain on the growth rate and a partial reflection of inadequate urbanization. The middle Godavari valley which includes Marathwada, a part of the erstwhile Nizam State, shows an increase not quite comparable to other areas.

Though temperamentally the Maharashtrians

in all parts may be alike, the western part is culturally more advanced and shows a better educational attainment than either the Tapi or Wardha-Wainganga basin. The most conspicuous, however, is the social backwardness of Marathwada, where a general low level of literacy is associated with a virtual absence of education among the females who, subjected to the rule of Nizams were more underprivileged than their counterparts elsewhere (Fig. 19.4).

Population distribution : With a population of over 30 millions spread over an area of 276,777 km², the density of population does not reach even the national average and works out a little over 110 persons per km² in contrast to 138 for the country as a whole. The un-uniform distribution is resource-oriented, varying with the productivity of the land and the degree of industrial development. In some areas, urbanization has been a factor in increasing the overall density. The rural population density, therefore, does not always accord with the gross density. The Tapi-Wardha divide and the Wardha-Wainganga basin on the east and the slopes of Satpura on the north, with their thin soils and extensive forest cover, are the least populous areas of the region. The rural population density in these areas doe

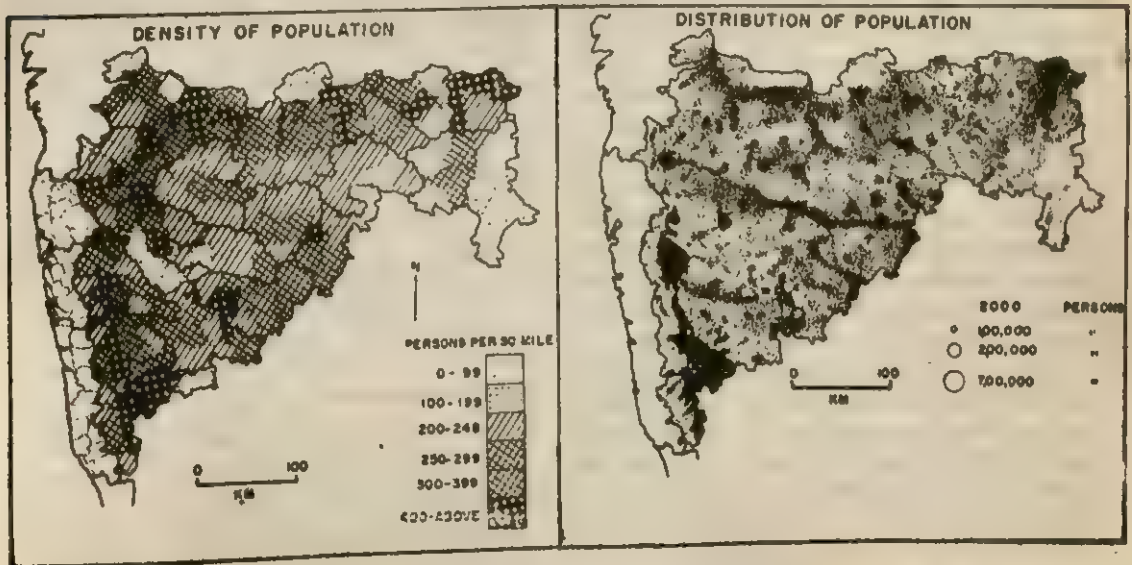


Fig. 19.4

not exceed 80 persons per km² and Chanda, the most forested and the least inhabited part of the region has 45 persons, the lowest in the State of Maharashtra. Bhandara, though in the same ecological zone as Chanda, makes an exception with its rice fields and mineral resources. The basins of Krishna and Bhima, despite the inclusion of Sahyadri and the rugged 'Maual' in their fold, are the most populous. Heavy rainfall, turned to good account by opening a number of irrigation works, and the deep black soils of the river valleys, sometimes with large alluvial terraces, have attracted more people. The Sholapur-Poona-Kolhapur triangle is the most densely populated core of the region. Perhaps the pressure of the Moghul power from the north-east during the late 17th century produced a squeezing effect that compressed Maratha elements of the society in a narrow zone that offered the most strategic site for guerrilla warfare. Equally populous is the Tapi valley, the East and the West Khandesh, the cotton-yard of Maharashtra. With very little of its area above 450 m contour and a deep black soil cover, East Khandesh supports large population clustered largely along the transport routes, and has the highest population density in the region next only to Kolhapur district. In contrast, the middle Godavari valley, the Marathwada tract, shows a considerable thinning of population with few towns and a rural population density, level with the regional average. Inadequacy of transport and the dearth of a significant resource base, except the medium black soil, without much benefit of irrigation have been more often a 'push' and exercised little attraction. Aridity, generally interpreted as a factor in low population density, does not appear very significant as Farbhani and Nander both in the dead core of the region have more rains than Nasik and Ahmednagar. In fact, the dry pockets and scarcity tracts of Maharashtra fall in Ahmednagar and Sholapur districts, but both the districts are better developed than Marathwada. Urbanization has played a vital part in raising the overall density of the districts of Vidarbha, Khandesh and Nasik. Nagpur, Wardha, Amravati and Nasik stand out as pivotal points in thin population cover of their country-side.

The sex ratio is fairly uniform and balanced in most parts, there being 935 females for every 1,000 males for the region as a whole. Rural-urban migration has disturbed the ratio in areas where the pull from the cities has induced a flow of periodic or permanent migration. The district of Satara, one of the least urbanized districts of Maharashtra, and not far from Bombay has more females than males in its rural population. Subjected to poverty and domestic confusion, the male members find an escape and a remedy in migrating to Bombay where the job opportunities are better. But for the local industries as in Poona, other areas in the western part of the region, where daily commuting has largely replaced long distance migration, would have shown similar migrations.

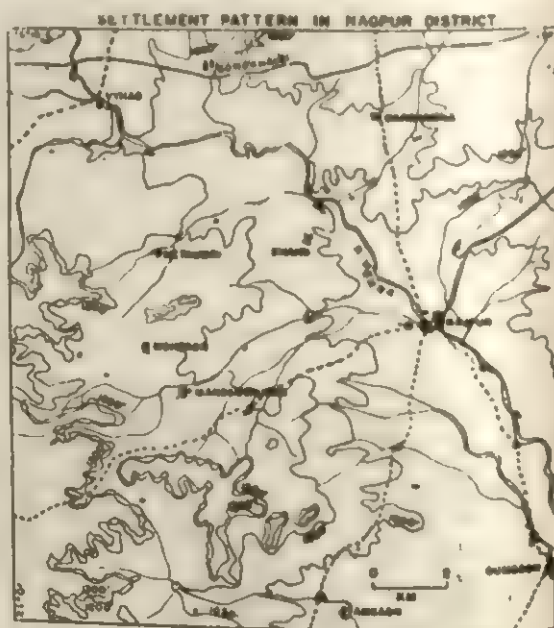


Fig. 19.5

Rural Settlements

About four-fifths of the people live in villages. The spacing and the distribution of villages are greatly related to the rural population density. The villages are not uniform in size and the pattern of distribution is akin to urban hierarchy in space (Fig. 19.5)

Soil and the availability of water have been the main considerations in village location. Water courses bordered by narrow alluvial terraces have been the most favourite sites for villages. Land for cultivation in the valleys and the drinking water from the wells in the bed of the streams, have attracted the settlements. Even the settlements on the plateaus are oriented to water courses. Approach to a village is signalled from a distance by linear groves of trees along the streams in which a mass of tiny houses is sheltered, normally not exceeding 500 people, those larger in size usually occur near the large towns, or on the main transport thoroughfares, assuming a significant role as service centres. A large village is generally a market place with a weekly bazar, a post-office, a police station and a community development centre, and is attended by such craftsmen as the tailors, cobblers, carpenters and the goldsmiths. Added to these is a medical practitioner who may command a zone of 5 mile radius. A small village may be a large hamlet occupied by people of an endogamous group exclusively engaged in farming or a multispectrum rural society with many castes and a few or no artisans.

A village in the plateau region is a compact structural unit. Increase in productivity because of irrigation has, of late, encouraged many farmers to leave the village and develop a farmstead of their own. The traditional *Mala** provides the necessary nucleus for such a farmstead. Away from the village but close to one's fields there may be temporary dwellings of farmers called *vadi* or *vasti*. Part of the village is always in ruins, the houses being deserted by the occupants for better opportunities in a nearby town or as a result of their having shifted to a *vadi*.⁷

The layout of the village is often irregular, though a central street is the common feature of all villages with many irregular and winding streets. A platform generally built around a tree or near a well, not always in the centre of the

village is a place for casual evening get-together. The settlement-field relation is not always clear, but the best agricultural land is always nearest to the village. Distant fields represent areas of marginal productivity.

The village as a whole and the arrangement of houses inside are rather confusing as they have resulted from a process of accretion in which nothing but the whims of the individuals and the availability of land have been the main elements. The houses of untouchables are generally in the peripheral zone of the village. In middle Godavari valley, the villages are often walled, a legacy of the past when the conflict between the ruling dynasties of the Deccan forced the villages to have their own security arrangements. Depending on the size, the plan and the use of building materials, several house-types can be distinguished. The largest and most massive of the village houses are called *wadar*, owned by *Patil*, the village headman, or any other rich person, and built of stones and bricks with tiled roofs. Single storeyed smaller houses with a cattle-shed in the front or back, are, however, more common. Mud walls are the common feature of houses owned by poor people, but the poorest possess the thatched huts having walls of mud and wattle reed. A typical middle class house in the village invariably has an *osari*, a front varandah, a *majghar*, the central room and a *deughar* or the deity-room. In the dry central part of the region villages generally have flat mud roofs supported by beams. The borderline between the flat roofs and the tiled gabled roofs roughly coincides with 600 mm isohyet.⁸

The village organization displays a traditional hierarchy which holds good even today. The hereditary chief of the village is a *Patil*, generally a Maratha, who held large acreage as *vatan*, the land given to him by the village. Besides, the *Kulkarni*—the village accountant, the carpenter, the ironsmith, the barber, and several others of the *balutedari* system owned *vatan* land. The *Vatan* system has since been abolished but *balutedars* still persist. The rural social organization headed by a *Patil* and supported by a well-defined hierarchical system of village artisans, the *balute-*

* A 'mala' is the most fertile land of a farmer with a well inside and equipped with some means of lift irrigation, generally a pump.

der, is what made the village a viable socio-economic unit. The traditional village organisation is fast giving way to a rural community oriented essentially to economic progress either through a changed pattern of more efficient farming, responding more readily to the influence of industrialization, or by participating actively in the general flow of rural-urban migration. Village Panchayats, the lowest rung in the Local Self Government and the farmers-co-operatives have largely replaced the old groups. The old rivalries and factions have, however, penetrated down to the level of political parties which are sometimes locally dominated by one community or the other. Improvement in the economic life of the rural population has not solved the social problems. The increased productivity has not changed the economic scene and the rural life as anticipated, and is often syphoned back to the urban centres through litigation over property rights, and the feuds which often result in loss of life and mean a wasteful drain of economic resources in the follow-up court proceedings.

Urban Settlements

About a fifth of the population of the region lives in towns of varying sizes and functional composition. Developed in phases, the earliest of the towns were the capital cities like Paithan, Junnar, Karad and Deogiri all of which were governed by administrative and defence considerations in their location. The early capitals have since decayed. Paithan on the Godavari near Aurangabad and once the rich capital of Satvahanas, hardly speaks for its past glory. Deogiri, modern Daulatabad, is equally a neglected place today. The medieval period saw the advent of Muslim rule in the region and the establishment of a number of well-fortified regional headquarters in a country torn by feuds and rivalries. The fort and the city walls were the essential features of these towns whose bifunctional character rested essentially on defence and administration. With the fort towns which were the seats of ruling dynasties, or the headquarters of a *subedar* or a *pargana*, there was a simultaneous

growth of small but significant trade centres, market towns and a few religious places. Sholapur and Barsi in Bhima valley, Satara in Krishna valley and Nandurbar and Dhulia in Tapi valley were important market centres. There were not many temple towns. Nasik, Pandharpur and Trimbak were perhaps, the only exceptions which had a religious base. In 18th century many small towns sprang up as the headquarters of Maratha chieftains.⁹ Sangli, Kurundwad, Kagal, Ichalkaranji, Miraj, Phaltan and Bhore, to quote a few, are such towns.

Improved transport, which established more effective contact between the upland and the coast, ushered in a new phase of urbanization that saw the growth of railside settlements into towns and the rise of many market centres following the cultivation of cotton over much of Khandesh and Vidarbha. The economy of the land assumed a more dynamic shape and its sensitivity increased to respond to market fluctuations in far-off places. Through improved transport the region started participating in the larger economic strategy of the country. To this period of the late 19th century, is ascribed the ribbon alignment of towns along the railways and important highways. The latest phase in urbanization is that of industrial development and the consequent growth of towns. During the last 40 years, industries have assumed the most significant role in determining the urban pattern of the region. It has led to the enlargement of existing towns, growth of new ones and the creation of an urban complex loosely diffused and creeping along the arteries of transport.

The degree of urbanization shows considerable spatial variation. It is fairly high along the Central Railway from Nasik to Nagpur, where there is a string of medium-size towns. The towns along Central Railway have grown much faster than elsewhere in areas of lower accessibility. In Krishna valley, the districts of Kolhapur and Sangli, with their large acreage under sugarcane are dotted with sugar factories which have been the nuclei of urban growth. The rugged land along the Sahyadri, the Godavari-Krishna divide and the upper Godavari valley are the least urbanized parts of the region.

The existing urban pattern of the region is characterized by a string development along the Central Railway interposed between Nasik and Nagpur, a cluster in Kolhapur-Sangli tract, and a number of regional towns and dispersed service centres. Poona, Nagpur, Sholapur and Nasik are the four large towns of the region. Supported by their industrial bases and standing as linkage points between their tributary centres and Bombay—the primate city—they play a very important role in the political and economic life of the country. Next on the scale of hierarchy are the medium size towns without a significant industrial or commercial base; but as centres of local trade and focal points in the network of transport they stand prominently in regional economy. Dhulia in Tapi valley, Aurangabad in Godavari valley and Kolhapur in Krishna valley are important regional centres. District headquarters, also functioning as service centres, combine administration with retail shopping and other services. These, with many market towns, weekly *bazars*, and some large villages, the last without the status of towns but most effective as service centres, cover the entire countryside. While the large towns standing like pyramids in the vast rural landscape are of recent growth, an after-effect of industrialization, the local market centres and weekly *bazars* are a legacy of the medieval period when the country's economy was not integrated and the location of service centres was governed by the regional or sub-regional needs of collection and distribution.

The morphological characteristics of the town bear the imprint of their origin more than the influence of their regional setting which is more clearly exhibited in their functional character. A few old towns like Nasik, Paithan, Pandharpur, Wai have the river-side aspect of religious towns with their landing stairs and temples, with their old core generally developed around the main temple. Nasik, the oldest of the religious towns on the Godavari, with its residential core compressed between Delhi and Ketaki gate and largely inhabited by priests and Brahmins, is a typical case. The cellular arrangement of its structure consists of the successive layers of shopping, ad-

ministrative, outer-residential and industrial uses, grouped around the old residential core of which the temple-complex forms the nucleus. Here the Bombay-Agra national highway stands as a divide between the old and the new Nasik. Not so old, but displaying similar structural arrangement are other river side religious towns like Wai and Pandharpur.

The medieval towns are distinguished by a fort, a castle or a palace not always well-preserved, around which the towns are built. This monumental part of the towns is not always in the geometric centre, and the later creep of the towns has responded to the locational needs of other economic and social activities. Most of these towns were walled at one stage or the other and in some cases the relicts of the city wall can still be traced. The old residential core, associated with a market and the shopping area close by, is typical of all such cities. The inner core was an urban microcosm with its residential areas, shopping centres, markets, temples, schools and places of recreation. Once the prestige areas of the towns, the old residential quarters are slowly degenerating into slums.

Later growth, focused largely on the Cantonment, the Civil Lines, or the Railway station, is more dispersed and less homogeneous in its demographic composition. Inhabited by upper economic class, it developed during the colonial rule and is growing fast even today. The present physical growth of town has an obvious polarisation with distinct peripheral zones patronized by different economic and cultural classes which sometimes develop exclusive residential colonies. The present planned expansion, though in itself plausible, is more in the nature of an outfit than a genuine remedial measure and has made no impact on the stifling atmosphere of the city-core which still houses more than half the population of the city.

Poona, the seat of Maharashtrian culture, is a case in point. Situated on the Mula-Mutha confluence, the city commanded the route that followed Indrayani valley, from the Borghat saddle. Originally known as 'Kasba Pune', its nucleus grew on a ford point of the river Mutha in what

is known as 'Kasbapeth'. The later axial growth along the modern Shivaji road, gave rise to an elongated settlement with 'Shaniwarwada', the castle, on its northern extremity. Accretion on the peripheral zone made it a compact little town on the right bank of the Mutha. Confined to the four quadrangles formed by the intersection of Shivaji road and Laxmi road, the old town consisted of Kasba, Budhwar, Ravivar and Ganesh *peths* to which were added later on, Shaniwar, Narayan and Sadashiv *peth* on the west and Rasta and Bhavani *peth* on the east. Once the fashionable little town of Peshwas with its markets, temples, shopping areas and the royal residence, the Vishrambaug wada, the old core of Poona though still bustling with activity is overcrowded and bending under congestion. Here in the old town crowded with people (more than 500 persons to the acre) the shopping and residential areas interdigitate into each other and present a matrix of structures of which the 'wada' rectangular rooms arranged around a courtyard, is the most common type. Wooden frame-work and pillars filled in with thin brick walls support multi-storeyed houses which, though apparently fragile and weather-beaten, stand resolutely despite their uncouth appearance. Cultural segregation inherent in later growth and a common feature of the towns of Maharashtra, is best seen in 'Sadashiv Peth' an enclave occupied by Brahmins. The old town designed for pre-automobile age is facing serious problem of internal circulation.

The cantonment, established as headquarters of Southern Command of the Indian army added a new element in the urban landscape, that was characterized among other things, by a colony of westernized non-local population consisting of Parsis, Gujaratis and Punjabis in the neighbourhood, forming a cultural enclave, which has developed the most flourishing upper class shopping area, the Mahatma Gandhi Road, popularly known as Main Street. The juxtaposition of the old town with its temples, narrow streets and congested houses and the Cantonment with its banks, travel agents, restaurants and fashionable shops, presents a sharp contrast typical of a growing medieval town.

Forced by congestion and dearth of space, the old town took a leap to the other side of the river, where around the nucleus of Deccan Gymkhana developed the middle class residential areas, the Prabhat Road and the Municipal colony. The left bank of the river developed in 20th century is much better planned with its small but well-provided shopping area, the Deccan Gymkhana, the Shambhaji Park, the Municipal theatre and a few cinemas and the restaurants. Initially a cluster of few houses and buildings, the Deccan Gymkhana has become a model of a residential neighbourhood.

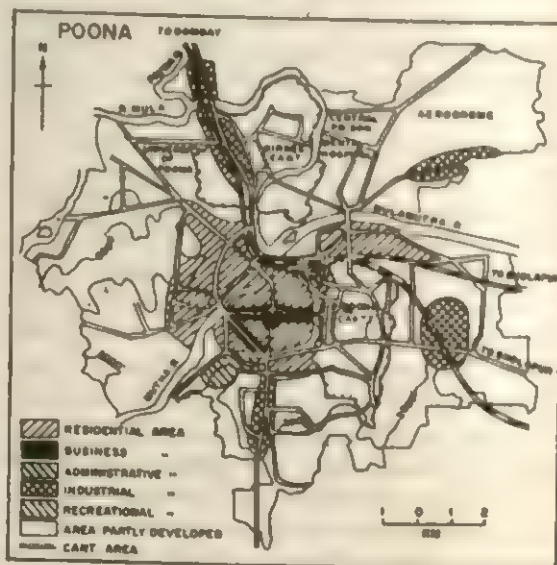


Fig. 19.6

Traditionally a centre of education and research, Poona has acquired an increasingly larger share of industries during the last twenty years, and the result is the appearance of an industrial belt on Poona-Bombay road, carrying a devastating aspect with its stores, backyards, gas plants and all the associated nuisances. This ribbon of industries while providing a solid economic base to the town, has created many problems including a large scale commuting (Fig. 19.6).

Other towns like Sholapur and Nagpur have also grown around the historic sites, a fort, a temple or a tank, and show similar morphological and functional features.

The Economy

Land use and Agriculture

Agriculture is the primary occupation of nearly two-thirds of the working population in the region. The productivity of the land is low. The gross value of output per acre is roughly three-fifths of the average for the country. About sixty percent of the area of the region is under cultivation and no part with the exception of Wainganga valley on the east and the Sahyadri zone on the west has less than half the land devoted to agriculture. Forest cover and skeletal soil on a crystalline base in Wainganga basin, and the dissected terrain having steep slopes with virtually no soil cover particularly in northern Khandesh and the western districts, account for much of the uncultivated land (Fig. 19.7). The Tapi-Wardha divide subjected to constant wash on both sides is not much better. Irrespective of productivity, the lower parts of Godavari, Bhima and Krishna valleys have relatively more land under cultivation (Fig. 19.8). The wide open valleys have thick black soils and the plateau tops, not subjected to heavy rainfall, have retained a thin soil cover which supports kharif-jowar and bajra. In some areas, however, the encroachment of the slope debris on the valley-side flats is creating a serious problem.¹⁰

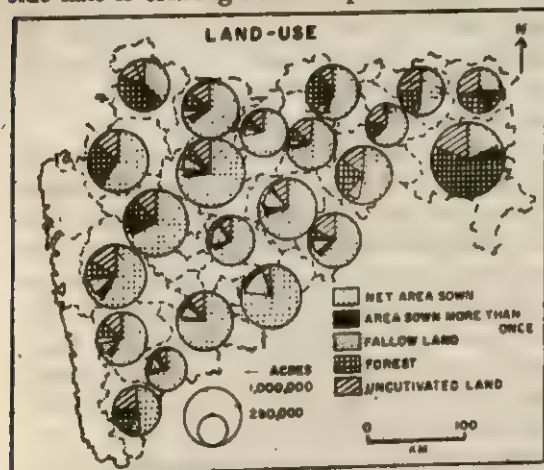


Fig. 19.7

Irregular terrain, thin soils of the plateau, inadequate rainfall in greater part of the region,

and dearth of irrigation facilities (only 7% of the land is under irrigation) account for low yields, in fact lower than the national average for most crops except sugarcane.

Land utilization in % of the total area¹¹

1. Forests	17.64
2. Barren and uncultivated	5.88
3. Land put to non-agricultural	2.31
4. Cultivable waste	2.92
5. Land under tree crops	0.61
6. Permanent pastures and grazing	4.56
7. Current fallows	3.81
8. Other fallows	3.73
9. Net sown area	58.54

Of the total cultivated area about 70% is under food crops and 30% is covered with oil seeds, cotton and other fibre and fodder crops. Cereals and pulses alone account for more than 2/3 of the cultivated area of the region. Over the years, the increase in the production of cotton and sugarcane has been relatively more rapid than in case of food grains.

Production in 00,000 tons¹²

Year	Food grains	Cotton	Sugarcane
1955-56	55.76	1.36	6.86
	(100)	(100)	(100)
1964-65	68.65	2.22	11.52
	(123)	(163)	(168)

This suggests a dislocation of acreage from cereals to sugarcane or even cotton. In the competition for land, sugarcane gets top priority if irrigation facilities are available and cotton is the next choice. Land is left for food-grains and oil seeds only if the crops with better commercial prospects do not thrive.

Food crops—Jowar, bajra, wheat and rice are the four important food crops of the region, of which jowar is the most important, occupying 6.32 million hectares and accounting for more than 60% of the total cultivated area of the region. The distribution of jowar, exhibits the influence

* The figures refer to the State of Maharashtra and thus include even the three districts of Konkan.

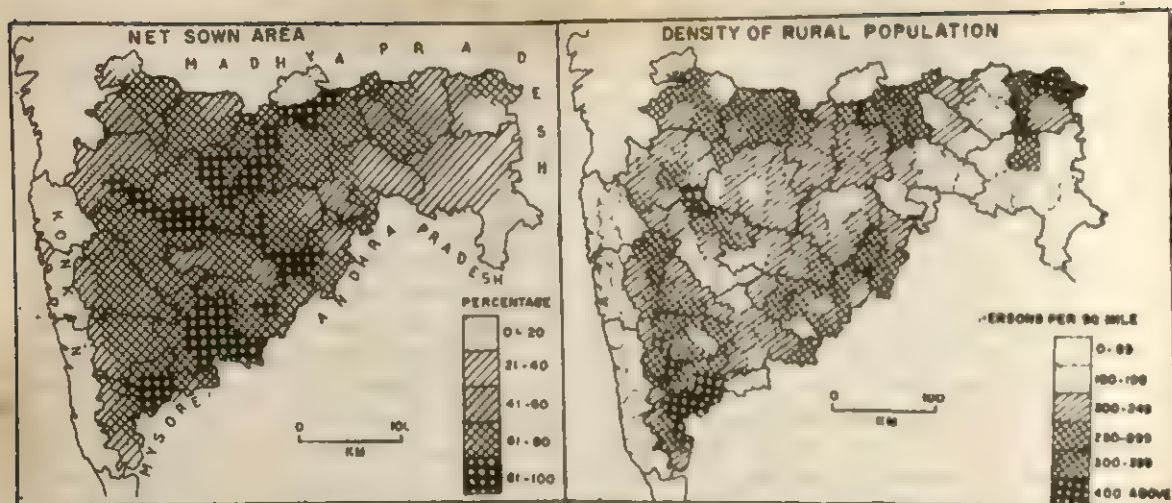


Fig. 19.8

of climatic and edaphic factors on the one hand and the social motivations and economic considerations on the other. While it displaces inferior millets like bajra by virtue of its higher yield to plateau tops and thinner soil regions, it fails to get priority over cotton especially in areas with good cotton soil and excellent transport and marketing facilities. Jowar can be grown both as a rabi, winter and kharif, monsoon crop; and the farmers have, through generations of experience, learnt to make an optimum choice depending on the slope, the nature of soils, and the rainfall regime of the area. It is usually confined to the zone with less than 800 mm annual rainfall, where the thick and moisture-retentive black soil supports rabi jowar which leads all other millets in yields. The plateau tops, on the other hand, with thin soil are given to more resistant bajra. With the increase in rainfall, light soils are utilized for growing kharif jowar, which depends entirely on the rains for its moisture requirements. The pattern of crop distribution emerges out of the choice of the crops with the promise of maximum output in the existing physical and economic framework of the region. Rabi jowar is thus predominant in the valleys of Godavari, Sina, Bhima and Krishna and their tributaries and the kharif jowar occupies the thin soil cover of uplands in Vidarbha region where the deeper soils

are given to cotton or wheat.¹³ Bajra, another variety of millets, generally considered inferior to jowar, besides being sturdier, grows in the same area as rabi jowar, but occupies thin and infertile soils that cannot support kharif jowar because of inadequacy of rains.

Wheat, the next important crop of the region is highly diffused, and does not show any marked concentration. Nowhere does it command more than 30% of the cultivated area. It generally needs irrigation, but is perhaps the only crop which can be grown in heavy silts without irrigation. Rice with its needs of higher rains is confined to Wainganga valley, where about 60% of the cropped area is under paddy.

Cotton, groundnut and sugarcane are the principal cash crops of the region. Cotton is largely confined to Tapi valley, the districts of Khandesh and Vidarbha with maximum concentration in Jalgaon. About 14% of the total cropped area of the region is under cotton with an annual production of 2.84 lakh tons of cotton lint. Groundnut, the principal oil seed of the region, though diffused like wheat, is more common in drier areas and inferior soils.

Sugarcane is a late arrival in the field of cash crops, and despite a continuous shift in its favour has not exceeded the two hundred thousand acre mark. Its cultivation is confined to the areas

receiving adequate and timely irrigation. The Godavari valley in Ahmednagar district irrigated by Pravara canal, Baramati-Indapur area in Poona district having the benefit of irrigation from Nira canal, and the Krishna valley down Satara including the districts of Kolhapur and Sangli are the main pockets of sugarcane cultivation. Thick and fertile soil a fairly long dry season and adequate water supply from the canals or from the river beds pumped and channelised to the fields have given impetus to the fast expansion of acreage under this crop. The yields with a 14-month growth cycle are one of the highest in the country and with a number of sugar refineries established during the last 20 years, cane cultivation has become a permanent feature of these areas.

Despite large area under cultivation, the agricultural efficiency of the region is low. This stems from poor and rocky soils which cover large parts of plateaus, inadequate rainfall which often creates scarcity conditions and dearth of water resources, both surface and subterranean. The rivers flowing on the plateau rely on the heavy rainfall in their source region, but once the monsoon is over their beds become a mere trickle of water.

The terrain imposes serious limitations; it is not always amenable to irrigation either because of altitude or because of relief conditions. The building of reservoirs to tap all the available surface water, though in itself a task, will not go beyond irrigating the alluvial terraces. There are no aquifers to hold subterranean water, and the inter-trappean beds, weathered trap, red bole or other sedimentary layers hold only limited water. The wells in the river valleys do yield more water, but these again are confined to a narrow zone along the river courses. The region, it is estimated, does not possess the irrigation potential for more than 1/4 of the cultivated area.

Irrigation

The existing irrigation facilities include canals, wells and tanks. While canal irrigation is most common in western part, wells are utilized to irrigate small acreages all over the region. In heavy rainfall areas of Chanda and Bhandara are a large

number of tanks, known as *mulguzeri* tanks, for irrigation. Low earthen dams are a common feature in upper Krishna valley and account for more than 1/4 of the irrigated land. Of the total irrigated area, more than half gets water from the wells and the remaining is largely contributed by storage reservoirs, tanks and small dams. Major irrigation works constructed by the Government account for little over 1/5 of the irrigated land.

The estimates of potential irrigation resources by the Irrigation Commission are very optimistic. "The total annual run off, with a dependability of 75% is estimated at 4,000 thousand million cubic feet (Tmcft); of this the utilisable yield has been assessed, on the basis of surveys already made, at about 2,000 Tmcft. The total utilisable supply for flow irrigation would, therefore, be about 2,000 Tmcft., which would be enough for irrigating about 100 lakh acres i.e. about 20% of the ultimate cultivated area. In the canal-irrigated area the sub-soil water table which gets enriched by percolation can be tapped through a network of wells and the water used for irrigation in combination with canal water. The system of lift-cum-flow may increase the irrigated area by about 15%. Another 15 lakh acres would be added to the irrigable command on account of additional quantities of water available at the distributary head due to lining of canals. Thus the total area irrigated from surface sources would be about 130 lakh acres or 26% of the ultimate cultivated area. With an intensity of irrigation of 66%, the total culturable command of irrigation works will be about 200 lakh acres or 40% of the ultimate cultivated area".¹⁴ The above estimates do appear inflated and in view of the inter-State river water disputes, paucity of development funds, and the slow overall progress, one wonders about the extent to which it is going to be realized.

Added to the limitations of nature is the nature of tenure. There are about 4 million farmers in the region most of them having small holdings and incapable of investment in the land, which has remained neglected for generations. The co-operative movement is an encouraging trend and about half the farmers have joined co-opera-

tives, which not only promote agriculture by granting credit and assuring proper marketing facilities but have added a new dimension in regional economy by undertaking industrial ventures and creating an economic force, the co-operative enterprise, parallel to the free or public enterprise. The region has about 30 sugar refineries and several other processing plants run by co-operatives.

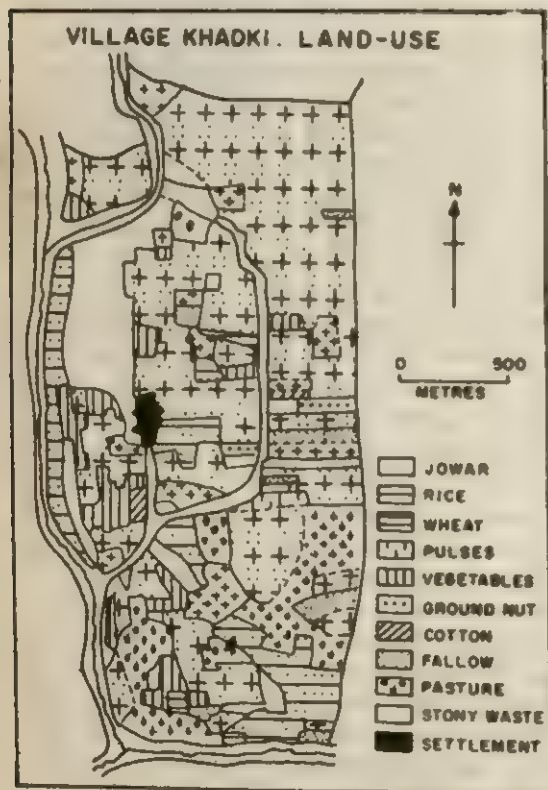


Fig. 19.9

Traditional agricultural practices still persist; but a definite change is noticed in the use of improved seeds, utilization of surface water by building small dams, and the increased use of pumps for lifting water from wells or rivers. High yielding varieties of crops are still at an experimental stage, but the use of fertilizers is increasing.

What is spectacular is the effect of canal irrigation on the rural landscape which is completely changed in areas where cultivation of cash crops particularly sugarcane has been assured on a large scale. One cannot fail to notice the agricultural

prosperity of the region, resulting from the plantation of sugarcane. Irrigation, tenure reforms and a sound agricultural practice hold the key to the agricultural improvement of the region. The study of Khadki, a village about 35 km south of Poona in Nira basin illustrates the prospects and problems of the western part of the region.

*Khadki village—a case study:*¹⁵ The village with a population of 250, distributed among 38 families and an area of 364 acres, of which about 82% is under cultivation, is girdled by the river Shiva-ganga on its west and the Gunjavani on the south, a feature which has influenced the slope and soil character of the village. Much of the village is on a terrace in which the river is entrenched presenting unmistakable signs of rejuvenation. The terraces carry the river deposits covered by a top layer of black soils 1 to 1.5 m thick, which gradually thin down in the direction of the river and gullies (Fig. 19.9).

The fields, represented by the original survey members, are usually a quadrilateral, often a rectangle or a square in the eastern part of the village, where no undulations are observed. The shapes depart from a perfect rectangle with increase in slope and irregularity of terrain. The valley slopes are the areas of most irregular field pattern, where small patches of peculiar shapes emerge to utilize flat land and thin soil cover at different levels. The pattern becomes all the more complicated because of gullies and rivulets which add to the complexity of slope conditions; this can be seen in the southern part of the village. A general parallelness to the contours exists among the fields in the bed of the stream. Paddy fields are particularly very small in contrast to the larger jowar fields on the level land though even the latter have been sometimes fragmented to accord with the slope of the land. About 60% of the cultivated area is under rabi jowar, which is favoured by deep black soil and a rainfall not exceeding 750 mm. The village does not have the plateau tops and infertile soil to be utilized by bajra or kharif jowar. The thick soil is always used for the crops with maximum yield which in this rainfall zone is rabi jowar. The river-side flats, subjected occa-

sionally to flood are occupied by paddy. The moisture requirements of rice are met by irrigation from the river, and a miniature canal which is fed from a reservoir about 800 m up the river. Here in the village, regular flat areas with black soil support rabi jowar and are double cropped if irrigation is available, growing vegetables as kharif and jowar as rabi crop. The fields in this zone are larger. The steep slopes of the valley sides bear a thin cover of creep material, with localised rock exposures and are suitable only for grass, or some fodder crop. Occasionally the slopes are terraced; supported generally by structural benches, narrow and winding, they carry some soil and respond favourably to irrigation, producing peas and other vegetables.

Irrigation from a small reservoir on the Manganga river and use of pumps to lift water from the river further down are the most encouraging features in the agricultural economy of the village. It is obvious that small weirs on streams to tap the flow at many points depending on the need, will be more effective than the large scale irrigation projects which often prove an interference in the farmer's arrangement of crop distribution. Small dams built with the help of Local Self Body also imparts a sense of enterprise to the farmers. Agricultural practices are traditional which the farmer has established after generations of experimentation. Wooden plough is still the most important and the most common agricultural implement. The village has in all 12 pairs of bullocks that provide the traction power for 250 acres of cultivated land suggesting that a pair of bullocks is adequate to take care of 20 acres of land in the black soils which do not require so much of tillage.

Minerals, power resources and industries

Along with agriculture, industries form an important element in the economy of the region. These are extractive industries like mining or processing plants manufacturing finished products. Minerals of the region include coal, manganese, limestone, chromite, bauxite, iron ore and ilmenite. The older rocks of the area bearing mineral deposits being buried under Trap, the minerals occur

only in the eastern and southern peripheral zones where these rocks are exposed (Fig. 19.10)

Coal—Associated with the Lower Gondwana, coal occurs in eastern part of the region in Kamptee, Umrer, Bander and Wardha valley coal-fields. Of these the Kamptee and Wardha valley coal fields have large estimated reserves of 445 million and 627 million tons respectively; Umrer deposits are comparatively smaller having a total reserve of 70 million tons. These deposits occur in the vicinity of Nagpur within a radius of 50 km. The Kamptee coal has 5 to 10% moisture.

Manganese occurs in Nagpur and Bhandara, the eastern part of the region, in a belt that continues into the adjoining Chhindwara and Balaghat districts of M.P. The manganese reserves of the area are one of the largest in the country¹⁸.

Limestone deposits are largely confined to Wardha-Wainganga basin (the districts of Yeotmal, Chanda, Nagpur and Bhandara). The probable reserves of cement grade ore in Yeotmal are 102 million tons while the proved reserves amount to 44 million tons upto a depth of 150 m. These deposits contain about 50% lime. In Nagpur and Bhandara, crystalline limestones and marbles occur in Sausar series of Archaean, generally siliceous dolomitic and occasionally mangniferous.

Chromite is found in the Wainganga valley in Bhandara district. There are important deposits of *Bauxite* in the crest zone of Sahyadri. These are high-altitude bauxites in the districts of Satara and Kolhapur. In Satara, bauxite occurs in laterite near Mahabaleshwar, while further south in Kolhapur district important deposits occur at Radhanagri, Ambolighat, Gargotti, Dhangarwadi and Rangevadi. The total reserves of the area are estimated to be of the order of 53 million tonnes.

Iron ore—Important deposits largely connexed to Chanda district occur at Lohara, Puser, Pipalgaon, Asola and Dewalgaon. These occur in a series of lenses associated with banded haematite-jasper. Most of these haematite deposits have 60 to 65% iron and some are being exploited.

Power Resources : Coal and water are the two important power resources of the region.

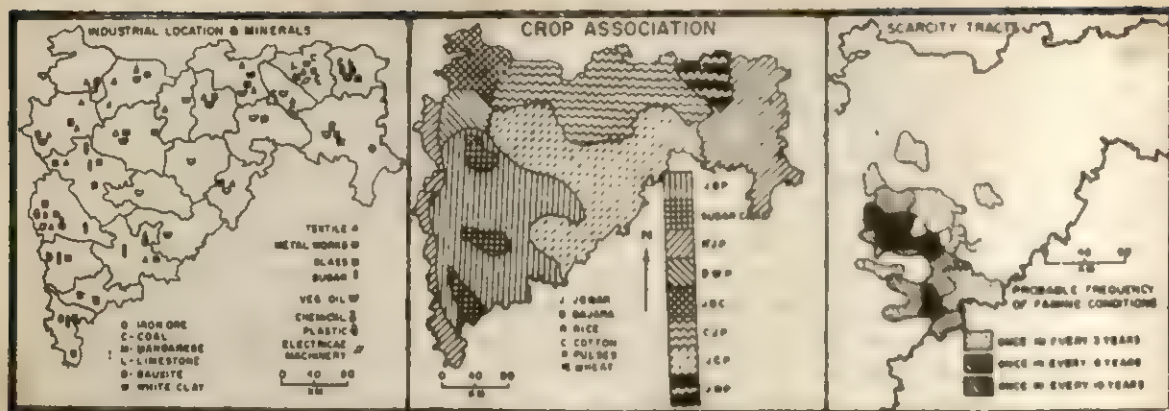


Fig. 19.10

The western part of the region relies heavily on the hydroelectricity generated at the foot of the Ghats in Konkan by diverting the source waters of a number of plateau-rivers which flow eastwards. The koyna hydro-electric scheme with an installed capacity of 540,000 kw, Radhanagari (Kolhapur) with an installed capacity of 4,800 kw and the Tata Hydro-electric schemes at Bhivpuri, Khopoli and Bhira are important hydro-electric works which produce bulk of the power. These generating plants suggest an inter-regional coordination, the reservoirs for most of them being located on the plateau in the heavy rainfall zone of Sahyadri, whereas the generating sets are installed in Konkan at the foot of the escarpment to get the required head. Other hydro-electricity works include installations on the Purna, Vaitarna, Pench and Penganga rivers. In the eastern part of the region, thermal power stations at Khaperkheda (Nagpur), Ballarsha (Chanda), Poras and Bhusaval are the main sources of electricity. Some more thermal power plants are being installed at Nasik, Koradi (Nagpur) and Parli.

Industries : The region does not present a very bright picture of its industries and fades into insignificance when juxtaposed with the industrial landscape of Bombay metropolitan region, which overshadows the industrial development on the plateau. With a few exceptions, the industries are often resource-based, and concentrated in a few places like Poona, Nagpur, Sholapur, Nasik,

Satara and Kolhapur. Of these, Poona alone has developed a sound industrial base with its metallurgical, chemical and not a few diversified industries¹⁷, all of which use very little local resource and have chosen Poona as the second best place after Bombay. The place, besides being located at the threshold of Peninsular India, is the focal point of transport and commands a high degree of accessibility. Cheap land, as compared to Bombay, and adequate power after the completion of Koyna project, with a tradition of its own that provides the necessary skilled personnel, are some of the factors that have attracted industries here. A good climate, and the reputation that the city has as a centre of education and a cultural seat, have attracted people from all parts of country and particularly from Maharashtra, a phenomenon that has saved the industrial enterprises from the crisis of skilled manpower. Most other industrial centres use local raw materials.

Cotton textile is by far the most important industry, both in terms of production and employment, relying heavily on local cotton. The industry includes textile mills and a subordinate sector which includes powerlooms and handlooms. Sholapur, lying in the cotton area and located on Bombay-Madras railway is the largest textile centre. Nagpur enjoys a similar position with 14 textile units. The districts of Vidarbha guided by excellent transport have developed textile

mills at-Hinganaghat (Wardha), Pulgaon, Akola and Badnera. With the exception of Nanded, all other textile units seem to have given preference to efficient transport, and thus a large number is tethered to the Bombay-Calcutta or Bombay-Madras railway, both of which traverse a large territory. Amalner, Jalgaon and Dhulia in the north and Ichalkaranji, Kolhapur, Sangli and Miraj are smaller centres of textiles (Fig. 19.10).

Sugar refining is another of the industries based on agricultural raw material. The increase in area under sugarcane, concentrated in the irrigated tracts of Godavari and Krishna valleys, has witnessed an increasing growth of sugar factories which are raw material-oriented. The factories are located in the cane-producing areas of Ahmadnagar, Poona, Satara, Kolhapur and Sangli districts. Numbering forty, most of these are run on a cooperative basis, and both, the cane-yield from the fields and the percentage recovery of sugar from the factories are one of the highest in the country.

Oil mills are diffused all over the region in the areas producing groundnut, particularly in Tapi and Wardha basins. The oil produced in these mills provides the necessary base and the impetus to the growth of hydrogenation plants which are located in the districts of Jalgaon, Buldana and Akola, all of which have a large acreage under groundnut.

The forests of the region support several industries by providing raw materials of which paper and paper-board rank first. The biggest paper plant is located at Ballarpur in Chanda district which utilizes bamboo as raw material. The processing of tan-extract from *birda* in Kolhapur and the distillation of essential oil from *Rosa* grass in Dhulia are other industries supported by forests. The most common and ubiquitous are the saw mills started with very little capital and spread all over, where forest stands can make them feasible.

Machine manufacturing, quite unrelated to the raw material and sometimes guided by the location of markets, is centred in the two large cities, Poona and Nagpur, where the demand from other industries, and the facilities for banking and finance, with a better possibility of getting skilled

personnel, attract such industries. Machine manufacturing at Poona is highly diversified and has a wide range including oil-engines, electric motors, automobile fittings and fixtures, dairy equipments and a large variety of small machines. Besides Poona and Nagpur, Kirloskarwadi in Satara district is an important place that has specialized in the manufacture of agricultural implements. The metal-based industries are fast developing in important industrial centres. Another industry which developed without there being adequate local raw materials in the region is glassware industry located at Poona, Nagpur and Ogalewadi. Local market has compensated for the transport of silica from other parts of the country.

Concentration of industries in a few centres and the consequent regional imbalance in economic growth have promoted regional rivalries and discord. Marathwada, the middle Godavari valley, appears least favoured. Tapi valley is equally neglected and does not enjoy an industrial growth comparable to Poona and Nagpur regions. There is a growing belief in the less developed areas that development is a politically motivated process and no thought is given to inadequacy of other locational factors. It may, however, be conceded that locational decisions are sometimes influenced by political considerations though left to themselves the industries, particularly in the private sector, always look for the best location. Spatial decentralization of capital investment and the regional dispersal of industries, though in themselves plausible, are not to be pressed too far against the odds of economic inviability. What is important is to create conditions that may offer comparable location to industries in terms of economics of location.

Transport

The intra-regional circulation is aided by railways, roads and to some extent by air ways. Irregular and dissected terrain with all the limitations of relief have rendered the laying of railways difficult and even uneconomic in less developed areas, with the result that the roads have become the most important channels of transport. Though railways are suitable as long distance



Fig. 19.11

transport medium, for short distance transport, roads are very effective. The railways, a nationalised public enterprise, with their uniform policy do not have an intensive network in the region. Bombay-Calcutta and Bombay-Madras are about the only two major railways that take much of long distance transport load. These are supplemented by several other relatively less important routes and chord lines. The region has about 5,000 kilometres of railways.

The road-system consists of national highways, State highways, major district roads and other minor roads. Maharashtra as a State has more than 50,000 km of road, of which about one-fourth

is classed as national and State highways. Unlike the Great plains of north India, roads are more important than railways in handling the passenger traffic in this part.

Road transport is almost completely nationalised. The Maharashtra State Transport Corporation has the virtual monopoly of passenger traffic. It has a fleet of over 5,000 buses carrying more than a million passengers every day. It must be admitted that the road transport services, though nationalised, are quite efficient and the Corporation has improved the accessibility to many neglected parts. The underdeveloped middle Godavari valley, the Marathwada area, and the forested

lower Wainganga basin, however, still suffer from inadequate transport and relatively poor accessibility.

Operational efficiency of the road transport system is considerably restricted because of poor road conditions. The national highways are no better than the state highways and in some parts are even worse. Not much has been done to improve these roads despite a heavy increase in traffic. A drive on some of these national and state highways is a most disappointing experience. Quite often the roads are slippery with a thin paste of clayey material during monsoons, while one finds the vehicles lost in clouds of dust during summer. Narrow bridges and culverts built a hundred years ago stand unwidened and present a serious menace to the motorists. All the roads are not properly surfaced and are sometimes a mere apology for roads. Causeways on smaller streams are more common than bridges and not infrequently during rainy season the motorists have to wait for the flood waters to recede, before crossing the river. Negotiating the hazardous curves in the ghats is an exercise in driving.

Only a few cities of the region are linked by air. Poona, Bombay and Aurangabad are linked with Bombay by air services operated by the Indian Airways Corporation (Fig. 19.11).

The Regions

The Maharashtra Region with its strong physical and cultural unity presents a considerable diversity of landscape features which are helpful in distinguishing 4 first order regions (38 to 41); the Maharashtra Sahyadri, the Tapi-Purna valley, the Maharashtra Plateau and the Vidarbha plain. Each of these four regions after detailed examination reveals distinct local physical and cultural variations so that in all 11 second order and 22 third order regions can be recognised as follows (Fig. 19.12):

XVIII Maharashtra Region

38. Maharashtra Sahyadri

- (a) Maharashtra Sahyadri North
 - (i) Crest zone
 - (ii) Maval country

- (b) Maharashtra Sahyadri South
 - (i) The Koyna Region
 - (ii) The Region of Spurs and Valleys
39. Tapi-Purna Valley
 - (c) Tapi-Purna Valley West
 - (i) West Khandesh or Dhulia Region
 - (ii) East Khandesh or Jalgaon Region
 - (d) Tapi-Purna Valley East
 - (i) Burhanpur Region
 - (ii) Purna Valley of Akola-Amravati Region
40. Maharashtra Plateau
 - (e) Ajanta Hills
 - (i) Ajanta Hills West (Aurangabad)
 - (ii) Ajanta Hills East (Buldana)
 - (f) Upper Godavary Valley
 - (i) Upper Godavary Valley West
 - (ii) Upper Godavary Valley East (Nander Region)
 - (g) Balaghat Upland
 - (i) Ahmadnagar Region
 - (ii) Manjra Plateau
 - (h) Upper Bhima Valley
 - (i) Upper Bhima Valley West
 - (ii) Upper Bhima Valley East
 - (i) Mahadeo Upland
 - (i) Mahadeo Hill Region
 - (ii) Upper Krishna Basin (Kolhapur Region)
41. Vidarbha Plain
 - (j) Wardha-Penganga Plain
 - (i) Wardha-Penganga Plain West
 - (ii) Wardha-Penganga Plain East
 - (k) Wainganga Basin or Nagpur Plain
 - (i) Nagpur Plain North
 - (ii) Nagpur Plain South

The Maharashtra Sahyadri forms the higher western edge of the Deccan plateau overlooking the narrow Konkan lowland and separated from it by a fault escarpment with variable heights in different sectors. Sahyadri, besides being the continental divide between the two water systems, one directed to the Bay of Bengal and the other to the Arabian Sea, is also a barrier between the coastal lowland and the plateau upland. From the plateau to the coast it is a big leap to a different ecosystem integrated with the plateau only through

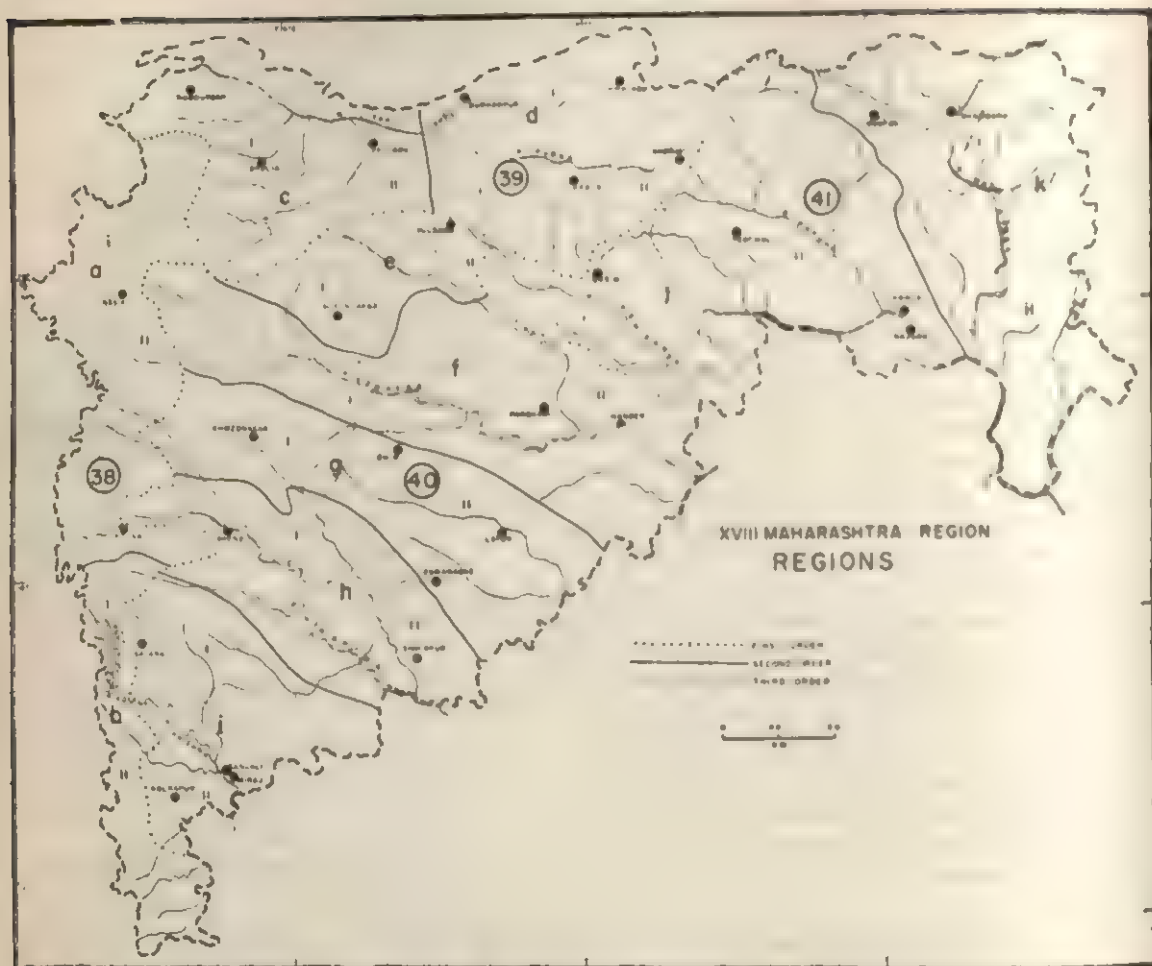


Fig. 19.12

a common administration. From north to south, Sahyadri follows a sinuous line caused by unequal recession of the scarp, and is, therefore, not always parallel to the coast. The crest line locally called *Ghat Matha* presents variable altitude in different parts and though always forming the water divide it does not always coincide with the top of the escarpment and in few cases occurs much to the east suggesting that many of the crest-line surfaces developed by the easterly drainage have been diverted to the west by more active westerly drainage consequent upon the fault.

The highest point of Sahyadri is the Kalsubai peak (1,646 m) in the source region of the river Pravara, a tributary of the Godavari, followed by

a number of lesser plateaus and peaks. Mahabaleshwar (1,438 m), the plateau skirted by the deep gorges of the Krishna and the Koyna in their source region, is the highest plateau in the Sahyadri system. Bhimashankar plateau (1,000 m), in the source region of the Bhima, is equally extensive. Many of these plateaus are the old surfaces of erosion covered with red or lateritic soils. Between these higher plateau-interfluvies are the valleys sometimes graded to their sources where one notices broad plains, the pen-plained surfaces, in which the rivers appear shallow trickles of water, entrenched only in their lower courses which are adjusted to a new cycle. The erosional surfaces in the source regions of the

rivers, breaking the contiguity of the mountain chain are marked by saddles, locally called *ghats*, through which most of the routes pass. Nowhere these *ghats* are higher than 700 m A.S.L. Of these the Thalghat, 35 km south-west of Nasik and Bhorghat about 70 km north-west of Poona, are most significant for the transport system of the country. It is through these *ghats* that Bombay is linked by railways and roads with the Peninsular and extra-Peninsular India. Extending for over 450 km from north to south with its heavy rainfall, dissected terrain, deep red or lateritic soil and an evergreen floral landscape, Sahyadri, though structurally a part of the plateau, presents a different environment that is not in the least similar to the plateau. Twenty to forty km wide, this is the source region of most of the principal rivers of the Deccan. The narrow re-entrants have, in many cases, been turned into reservoirs for irrigation or power generation. Beale and Pravara, the tributaries of the Godavari, and Mutha and Nira, the tributaries of the Bhima have reservoirs in their source region for irrigation, and the reservoirs at the source of Andhra, Indrayani and Mula, all in Bhima basin, and at Koyna, the tributary of Krishna, have been utilized for the generation of hydro-electricity contributing significantly to the economy of the region.

Sahyadri is the main producer of Bauxite¹⁰ which occurs in Kolhapur district. Its irregular heights with plateaus and intervening chasms and a relative inaccessibility, all clad in forests and presenting a unique landscape, have attached certain degree of sanctity to the area, where some of the very old religious sites are located. Thus Trim-bakeshwar, at the source of the Godavari, Bhima-shankar at the source of the Bhima and Mahabaleshwar at the source of the Krishna are important religious places. To Maharashtra, Sahyadri is a fountain-head of many traditions, and in medieval times has been a natural fortification for the Marathas who challenged the Moghul power, watched their movements in the valleys from prominent ridges dotted with fortresses and took retreat descending down the escarpment into Konkan under the forest cover whenever faced with impending defeat.

Economically, the area is not prosperous. Poor soils as a result of erosion on the slopes and leaching on the flat plateaus, hardly support any crops except inferior millets like *ragi* and *nachni*. Paddy is confined to narrow alluvial flats along the rivers. Villages are small and few, always keeping to the river side. The hilly zone is largely inhabited by scheduled tribes who practise subsistence farming and engage themselves in hunting and fruit gathering.

A village in the hills is often an agglomeration of a few thatched, round huts with conical roofs. The road-side villages with houses of stone and tile are better built. Important settlements are either the places commanding the *ghats*, the passes in the mountain, or have developed as important religious places or hill stations. Igatpuri, Goti and Lonavala are essentially the gap towns, though the last one has also acquired the function of a hill station. Igatpuri and Goti are large villages, functioning as centres of paddy trade with a few rice mills. Lonavala, on the other hand, besides commanding the Bhorghat gap, is a miniature hill-station, with filling stations, hotels, picnic spots, and a relatively large permanent population employed in hotel keeping, maintenance of railway loco-shed, and a number of public and private institutions.

Mahabaleshwar is by far the most important settlement in Sahyadri. A hill station, with a permanent population of over six thousand, it has a large floating population during summer months from March to June, when it is thronged with people from western Maharashtra, particularly from large towns like Bombay and Poona. With the onset of Monsoons the holiday makers return, and the activities of this small but lively hill station almost grind to a halt. The town is plunged into monotonous rainy weather with drizzle, fog and occasional storms casting their gloom on it and making the life confined indoors, till it wakes up to find itself in the bright sunny October.

Maal : Close to Sahyadri, but not quite on the plateau, is what is known as *Maal*, where the ruggedness of the mountain persists in a gently sloping terrain with projecting spurs and ravines.

The region is known for its sturdy inhabitants, the Mavalas, who used to the rugged terrain and hard life since birth, rallied to the support of Shivaji in his wars against the Muslim domination of the region. Being a transition from the heavy to low rainfall, the area has a crop association in which the dominant element varies from paddy to millets depending on the conditions of terrain, and rainfall.¹⁰ More often the term *Maval* is applied to the western part of Poona district, the Maval taluka with its headquarters at Wadgaon, the Indrayani, Pauna, and Mula-Mutha valleys, all dominated by the hill forts (Lohgarh and Visapur in Indrayani and Singhgad in Mutha Valley.) This zone extending all along from north to south with its greenery and paddy fields, possesses the maximum potential for economic developments with its water resources, hill stations, and transport routes. Added to this is the unique scenery that gives it all the prospects of being a recreational zone of Maharashtra.

Tapi-Purna valley West : Confined between Satpuras on the north and the Ajanta hills on the south, the Tapi valley presents the aspect of a broad trough extending for about 160 km from Jalgaon to Nandurbar. The area is traditionally known as Khandesh, often referred to the two districts of Dhulia (W. Khandesh) and Jalgaon (East Khandesh). A scene of enormous sedimentation contributed either by tributary streams or initiated as the result of scarp retreat, it is one of the most fertile parts of Maharashtra and exhibits an economy which with all its traditions has not escaped the influence of the neighbouring regions to the immediate north. Possibly, Tapi is comparatively younger than other rivers of the plateau. Its later origin, ascribed to post-Trippean faulting is also manifest in its drainage system. The tributaries on both sides of the Tapi do not present a sub-parallel alignment, but (flowing in opposite direction) are parallel to the Tapi in their upper, and normal to it in their lower courses. The upper courses of some of these tributaries as Girnar and Panjra, to quote a few, are antecedent to Tapi in their upper courses and belonged to the Godavari system. These were captured later by the tributaries of the Tapi which degrad-

ing more actively to a lower base level diverted the head-waters of these rivers leaving the wind-gap of Nandgaon to stand as a divide between the two systems. The process of headward erosion by the tributaries, scarp retreat and filling in of the Tapi trough are still active. An increasing thickness of alluvium in the valley, and the occasional inselbergs in the landscape suggest a process of pedimentation and the development of a pediplain in which the alluvium-filled valleys simulate a *babada*.

Agricultural economy of the area rests on the deep black soil, small irrigation works and the industrious peasantry consisting of *Kimbi* cultivators. Bajra, Kharif jowar and cotton are the principal agricultural produce. Bajra occupies the infertile upland, jowar the medium black soil, while the deep black soils support cotton and wheat. Much of the land is unirrigated (Jirayat) reaching a level of 95% in Jalgaon district, though in Western Khandesh small dams thrown across the streams are very convenient sources of irrigation. Many of these small irrigation works are inherited from the Muslim period. The cultural landscape is characterized by Hemadpanti remains, the stone built temples, reservoirs and wells.

Halfway between the fringing mountains and the Tapi is the most fertile longitudinal zone. Rocky terrain near the mountains and dissection on the river sides have kept the human and economic activities to the minimum in these areas. The fertile land supporting cultivation, and the major settlements like Dhulia and Jalgaon are 10 to 20 km away from the river. The fertile crescent between Nandurbar and Jalgaon has many large villages and several towns connected by roads or located on the Tapi Valley Railway. The area is known for its production and export of cotton, of which Jalgaon and Bhusawal both on Central Railway, are important trading centres. Ginning presses are common features of medium-size towns; and there is a cotton textile mill at Jalgaon.

Dhulia (98,893) and Jalgaon (80,122) are the two district headquarters and important towns. The former commands the highway between

Bombay and Delhi. Located on the Panjra river and away from the Central Railway, it has experienced a relative isolation to which can be ascribed the slow pace of its development. Jalgaon, grown from a small settlement, is a centre of cotton trade and cotton textile manufacture. Malegaon (121,400) with its sizable weavers population has specialized in the manufacture of cloth on powerlooms which are labour-intensive and utilize the traditional skill.

The whole of Khandesh, the cotton yard of Maharashtra, has suffered from a relative isolation not being in the mainstream of cultural and political revolutions that occurred in Maharashtra. It has, however, absorbed influence penetrating from north without losing its identity as a part of Maharashtra, both politically and culturally.

The Tapi-Purna Valley East : A prolongation of Tapi valley, it is limited on the east by Amravati plateau, which marks the divide between the two river systems, the Tapi-Purna on the west and Wardha-Wainganga on east. Much of the valley is less than 450 m in elevation. Topographically the Purna valley is a broad, gently inclined trough bordered by Ajanta on the south and the Gavilgarh hills on the north. Known for its black soil and the production of cotton, Purna basin was for a long time under the Nizams and was considered the pride of his possession. Bestowed with rich alluvial soils, enough underground water, and a well-developed transport network, the basin in the cote of Vidarbha, a part of north-eastern Maharashtra, which for a long time was a part of Central Provinces. The region is bilingual and even the uneducated people know Hindi to some extent. Except the northern hilly area of Melghat where a higher rainfall makes paddy cultivation possible, the rest of the basin grows kharif jowar, cotton, wheat, and groundnut, depending on the soil and the availability of irrigation facilities, the latter usually from small anicuts. As in Tapi valley, here too, the large settlements and the major transport routes though parallel to the Purna which forms the axis of the trough, keep a reasonable distance from it to avoid the river-side ravines which, besides being an impediment to laying the transport routes are not very

popular. In fact, transport routes are so aligned as to pass through the most fertile areas with maximum population density. Akola in the centre of the valley and lying on Bombay-Calcutta Central Railway is a textile centre. It is the focus of transport from which the railway and the roads radiate in practically all directions.

Amravati-Badnera plateau is a separate geomorphic province forming the interfluvium between Tapi-Purna and Wardha-Wainganga basins, though economically it is oriented to Purna valley and Berar. The plateau is characterized by remnants of old surfaces preserved in the monadnocks of various sizes. The plateau with thin soil is agriculturally not rich and grows only groundnut and other kharif crops. Amravati, connected to the Central Railway at Badnera, is the principal cotton mart of Berar. The nucleus of the town grew in the old walled settlement with congested *mohallas*, but the later extensions outside the wall are better planned. The town has several ginning presses and oil mills. Another town on the plateau and almost at the foot of Melghat is Achalpur, a town of antiquity with medieval fortifications and abounding in monuments built in Muslim style of architecture largely ascribed to the Bahmanis. A cotton mill has provided the town a sound economic base and added to its importance in modern times.

Standing wall-like as a divide between the Narmada and the Tapi in their western and Tapi and Purna in their eastern part, the Satpuras provide the northern limit of Maharashtra, are subjected to headward erosion by swift flowing transverse streams and are reduced to narrow, forest-covered ridges with local prominences rising into hills. Unequal indentation depending upon the vigour of erosion by subsequent streams has given the range an arcuate alignment. The Satpuras like the Vindhya further east, have always stood as a barrier dividing two cultural and linguistic groups, and the breach in its eastern part by the Tapi has resulted into what is commonly known as the *Burhanpur* gap through which the Central Railway passes. Here is a transitional zone where the two cultures merge into each other. The Satpuras are known by different names in different

parts. In the extreme west projecting in Gujarat, they are known as Asirgarh hills dominated on the western extremity by Toranmal peak (1,150m) and Astamba Dongar (1,325 m). In the eastern part, Gawilgarh hills overlook the Tapi gorge with their highest point at Chikalda and are highly dissected by the tributaries of the Purna.

The region, largely inhabited by aboriginals, the Bhils, is undeveloped. Forests are the main economic resource. Inferior food grains are grown on soil-cover slopes and in narrow valleys. The Bhils, besides practising primitive agriculture, provide the agricultural labour needed in Tapi valley and engage themselves in wood-cutting, and collection of gum and honey. In Melghat region, *Kunbis*, *Gaulis* and *Korkus*, the three distinct social groups, are cultivators, herdsman and lumberers respectively.²⁰ Springs and river deeps are the only perennial water sources and the settlements are confined to river valleys and spring sites. Transport is not well-developed in the hilly region though a few roads including the National Highway No.3, link the Tapi and Narmada valleys. Chikalda (1,068 m) on Melghat plateau, is a second order hill-station.

Maharashtra Plateau : This gently sloping plateau from the Sahyadri eastward though apparently one is resolved into broad extensive interfluvies and the valleys. The plateau is sub-divided into the following units : (i) The Ajanta Hills, (ii) The Godavari Valley, (iii) The Ahmadnagar-Balaghat Plateau, (iv) The Bhima Basin, (v) The Mahadeo Upland.

The Ajanta Hills—The spurs projecting from the Sahyadri and standing as divide between the Tapi and the Godavari are known as Ajanta Hills, which become lower and assume the aspect of a plateau in eastern parts. The hills present more or less an escarpment face on their northern slopes but descend gently to the valley of Godavari in the south. The northern scarp face seems to be receding fast and has provided the sites for the world-famous Ajanta caves with their invaluable frescoes. If Satpuras form the barrier between the Narmada and the Tapi, the Ajanta are no less effective in isolating the Tapi basin from the rest of the plateau. At the southern foot of the hills

are a few strategic towns like Jalna, Aurangabad, Daulatabad and Khuldabad. These medieval towns under the shelter of the hills have been the important bases of the Moghuls, from where they launched attacks. The area is agriculturally poor, almost a barren land with thin soil growing some millets. The railways have avoided the hills, but they are not insurmountable by roads and Jalgaon-Aurangabad-Ahmednagar has been the traditional route between Tapi and Godavari valleys.

The Godavari Valley : The longest of the rivers of the Deccan, the Godavari virtually bisects the plateau of Maharashtra. Its importance and sanctity can be gauged by the fact that it is known in Maharashtra as the Ganga, and Paithan, a town on its bank, as the Kashi of the Deccan. With its fertile valley covered with deep black soil, the Godavari was the lifeline of Maharashtra in the past, and was indeed the cradle of its civilization. The most ancient towns and the capitals of ruling dynasties in Maharashtra, Nasik and Paithan, are located on its bank. With change in economy, increasing industrialization and improved accessibility in other parts, the valley is no longer the centre of political power or intense economic activity. Low rainfall (many places having 750 mm) has limited the agricultural productivity of the region, as the benefit of heavy rainfall in the Sahyadri zone has not reached here so far. The only irrigation project at Godavari is the Gangapur reservoir (16 km up Nasik) used for irrigation.

Surprisingly, the source region of Godavari is more prosperous than its lower parts in Maharashtra. Graded almost to the source, the soil cover is alike all along the valley but the rainfall increases towards the source, a fact that has made agriculture more prosperous. Added to this are the benefits of irrigation available only in the source region where the higher rainfall impounded in reservoirs is utilized for the purpose. Gangapur dam on Godavari near Nasik, Darna reservoir near Igatpuri and Bhandardara reservoir on Pravara, are the main sources of irrigation.

Irrigation facilities have encouraged the cultivation of wheat and sugarcane in certain pockets, though millets, largely jowar and bajra, remain

the principal crops. The impact of irrigation is considerable as seen in the changes in landuse and cropping pattern. In irrigated areas there is a general change-over to sugarcane, the crop with the maximum output. The rural landscape in these pockets is radically transformed and travelling through these areas one enters a domain of hectic agro-industrial activities, a tempo that continues from fields to factories and can be seen in the movement of machines and tractors, and temporary colonies of seasonal labour encamped along the roadside to clear the canefields, all geared to the efficient production of sugar. By far the most important cane growing area in the upper Godavari valley is the Shrirampur-Kopergaon tract watered by Pravara canal, where sugar factories have grown by the side of the cane fields thus integrating the agricultural and industrial economies and evolving in the process an agro-industrial landscape.

Except Nasik much of the Godavari valley in Maharashtra comes in Marathwada, the western half of erstwhile Nizam State of Hyderabad. Because of the large Marathi-speaking population it was restored to Maharashtra. The linguistic composition of the region is remarkably complex and as many as 52 languages have been returned as mother tongues in some parts during the 1961 census. The towns unmistakably show the signs of a former Muslim rule in their demographic composition. About 30% of the urban population consists of Muslims in Bhir district. The house types in the region reflect the unsettled conditions of the past when the fear of burglars and dacoits gave rise to houses without any opening in the walls.

Economically, Marathawada part of Godavari valley is poor. A fairly high percentage of land cultivated in these parts ascribed to extensive alluvial covers is misleading in face of poor yields. Dearth of irrigation facilities limited to a few wells has imposed on farmers the practice of growing monsoon crops, of which cotton occupies the best land and is the main cash crop. Some irrigation is practised from the tanks where terrain conditions permit. The only important irrigation project in the area is on Purna at two

sites, Siddheshwar and Yeldari, which together have brought more than 150,000 acres of land under irrigation. Cotton, as an important agricultural produce, has promoted some of the important cotton-trading centres as Hingoli and a textile mill at Nander. Large holdings and extensive cultivation, a reflection of inefficient agricultural conditions are typical of the area. This is particularly so on the plateau. Greater fragmentation exists in the valleys where competition for landownership is more and the division of every patch of fertile land among the descendants is most common.

The settlements in the valley have followed the water courses and are located on the terraces at a safe distance from the flood waters. Linear development of villages in the piedmont zone under the shelter of the plateau that protects them from the westerly winds¹¹ is a striking phenomenon. Fields, always in the sight of the villages located at higher levels, claim the best land. Transport is not well-developed and the existing roads are in a bad shape and interrupted at river points. The whole area appears neglected and resigned to its underdeveloped existence. No industries, very little trade, a thirsty land that yields some rain-fed crops, sleepy villages and neglected towns are all that can summarize the conditions in Marathwada. The single track metre gauge Godavari Valley railway from Manmad to Nander and further down to Hyderabad is all that exists in the name of organized transport, on which are located the four important towns of the valley, viz., Aurangabad, Jalna, Parbhani and Nander. This state of underdevelopment can be partly ascribed to the indifferent rule of Nizam showing little concern for economic development.

The urban pattern in the valley is characterized by some old and medieval towns some of which have readily responded to the modern changes and are fast developing into a twentieth century town with all its modern thoroughfares and industrial landscape. This can be illustrated by Nasik, which is developing on outer shell of modernity, with its highways, road-side hotels, new residential extensions, educational institutions, and industrial establishments superimposed

on the old compact residential core on the river-side. In contrast, Paithan, on Godavari, once the capital of Satavahana kings, and subsequently a seat of learning, is reduced to a sleepy little town with its traditional handicrafts. Aurangabad, a medieval town founded in 17th century is full of Muslim monuments. Presently the headquarters of Marathwada division, and the centre of Marathwada university, it is a tourists' paradise because of its proximity to Ellora caves and the historic town of Deogiri (Daulatabad) which was the capital of Yadava kings before it was sacked and captured by the Muslim kings of Delhi. Bhir, Parbhani and Nander are district headquarters. More important, however, are the cotton trade centres of Jalna and Hingoli which are full of life from October to February.

The general backwardness of Marathwada is a case of regional imbalance in the level of economic development. The problem now is, not only one of helping this area catch up with the other parts of the State, but more importantly, it is one of changing the regional thinking which largely ascribes the underdevelopment to discrimination and neglect by the Government.

The Balaghat Plateau : This extensive and marginally dissected plateau forms the water divide between the two major river systems, the Godavari on the north and the Krishna on the south. The height of the plateau ranges from 600 m on the east to 850 m on the west. Starting from the Sahyadri, the plateau with some remnants of the old surfaces of erosion, typified by Dholasane and Parner surfaces, slopes gently eastwards. The heavily dissected lateral escarpments of the plateau present badlands at their foot resting against its sinuous front. Beheading of the longitudinal plateau streams by the transverse tributaries flowing down the escarpment is a common feature resulting in unexpected elbow turns of many streams. Thus one wonders, if the upper course of Mula river does not represent the former headwaters of Sina beheaded by a tributary of Godavari, making Sina an underfit stream down the wind gap at Ahmadnagar. Perhaps the most significant example is that of the capture of Manjra river flowing on the plateau

by a tributary of Godavari through Nizamsagar lake.

The river Sina and the tributaries of Godavari have, by their headward extension from the two sides south and north, divided the plateau into two parts, the western part called the Ahmadnagar plateau and the eastern part, the upland basin of Manjra. Though prominent in the landscape it is an impediment to transport and does not possess much promise of economic development. It may have had some strategic importance during the medieval period providing defensive cover to Bhima valley which was the scene of intense military activity. A thin soil cover on the plateau, with little or no irrigation, supports only millet with rabi jowar wherever soil is thick in the valleys. The upland basin of upper Manjra is known for its cotton cultivation besides millet. Dry conditions with dearth of drinking water make the plateau an unpleasant area during summer.

The economy of the western half of the plateau is centred around Ahmadnagar, a medieval town developed initially inside the fort-walls and extended westward later on.²² Scarcity of water has hitherto hampered the growth of the town, but the city is now to get water from Mula reservoir and is attracting several industries, notably pharmaceuticals besides the traditional handloom and 'bidi' making. It is the centre of Jowar and groundnut trade. The focus of transport and trade in the upland basin of Manjra is Latur, an important cotton centre, while Osmanabad, a town on the plateau edge overlooking the Sina valley, is in a state of decline.

The Bhima-Krishna Basin : This is the core of Maharashtra region : economically the most developed, culturally the most representative, and politically the most powerful. Away from peripheral transitions, it has zealously guarded its traditions, maintained its culture through the upheavals of time, and profited to the maximum from modern technology. The area is, therefore, at once the most progressive and the most conservative showing an ideal blending of two cultures based on inherited traditions on the one hand and a rational outlook on the other. Maha-

rashtra owes a great deal to this part for its literary achievements and looks to it for leadership. Topographically it consists of 3 units, the Bhima Basin, the Mahadeo Upland, and Krishna-Panch ganga Basin.

Bhima Valley : Of the two valleys in Maharashtra, those of the Krishna and the Bhima, the latter is wider and more extensive. In fact, above the Krishna-Bhima confluence, the longitudinal profile of Bhima is gentler than that of Krishna, explained only by its larger catchment and presumably an older age. Debouching from Bhimashankar on the crestline of Sahyadri, the river collects a number of tributaries both from north as well as from south before it develops into a wide meandering river with flood-plains and terraces. Many of its tributaries have developed saddles in the mountains by headward erosion and guide the alignment of the land routes. The Bombay-Madras railway first follows the Indrayani valley, then the Mula valley down Poona till it enters the Bhima valley at Dhond. The river channels are bordered with fertile ribbons and terraces, which are intensively cultivated. In case of Mutha-Mula and Nira, irrigation available from reservoirs at the source has made agriculture more intensive, changing the cropping pattern in which cash crops like sugarcane, fruit-orchards, and grape vines occupy an important place. The higher plateaus, wherever covered with soil, support cultivation and in some cases are very productive if underground water is available. Thus Karha basin on Saswad plateau is a fertile upland basin. Jowar is still the most important crop in areas where the benefits of irrigation have not reached. The Phaltan-Baramati-Indapur tract in Nira valley is an important cane-growing area where irrigation from Nira canal has brought prosperity. Canal irrigation, however, threatens to create some problems by raising the water table of the irrigated areas and creating alkaline efflorescences.

In recent years many industries notably machines, metallurgy, chemicals, plastics, rubber and automobiles have developed in and around Poona which is the largest town of the region (though lying on the eastern flanks of the Sahyadri) and the hub of internal transport.

The town has a large hinterland and a focal point in the economy of the region called 'Desh'. The hinterland of Poona covers a very large area and culturally the whole of Maharashtra region is oriented to it.²² But even as a service centre, it covers a radius of more than 50 km. The enlargement of its economic base has given it a magnetic force that exercises a pull, felt even beyond the region. Quick growth of industries and problems of housing have necessitated commuting from the residential areas of the city and the suburbs to the industrial zone along the Bombay-Poona road.

Down Dhond, the wide flood plain of lower middle Bhima is the most extensive flat land with the highest percentage of net sown area. Sholapur district has 78% of the land under cultivation. The fertile black soils covering the flood plains have encouraged the cultivation of jowar and cotton, the only crops with good returns which can grow despite inadequate rainfall. Low rainfall (Akluj, less than 500 mm) has imposed serious limitations and prevented the farmers from growing winter crops. There is not much organized irrigation except in some western parts to which the command of Nira irrigation project is extended. Well irrigation is inadequate and isolated. Water scarcity, in fact, is the problem of the area and most of the settlements away from the river experience water shortage during summer.

The fertile alluvial stretch grades imperceptibly into Gulbarga Plain, an area occupied by Lingayat farmers. Sholapur (337,583), the nerve centre of the middle Bhima valley, marks the transition between the two linguistic and cultural areas, where the Maratha and the Lingayat groups are juxtaposed, and co-exist without losing their identity. With the locational advantage of being on the Bombay-Madras broad gauge railway, it has developed into an important industrial centre with cotton textile as the main industry with its appendage, the handloom. A focal point in the road network—as many as seven roads converge on the town—Sholapur has a centrality rarely enjoyed by any other town. As a centre of trade it functions as a regional town specializing in the collection and distribution of

cotton, millet and groundnut.²¹ Barsi, Kurduwadi, Akulj, Pandharpur and Mangalvela are the lower order centres and command smaller hinterlands. Of these Barsi (50,389) and Pandharpur (45,421) are outstanding, the former as a link town between Marathwada and Bhima valley and the latter as an important religious centre. Most of these towns, spread systematically, form a geometrical pattern that appears to conform to a hierarchical pattern. Pandharpur, situated on Bhima, also called Chandrabhanga after the crescent-shaped meander bend, is the scene of annual religious congregation in the month of July when the devotees of Lord Vishnu, throng in millions. Rest of the year, the town functions as an administrative headquarters and a centre of local trade.

Mahadeo Hill Region : The divide between the Bhima and the Krishna, dissected and narrowed close to Sahyadri, flattens out eastwards into plateau-like erosional surface preserving still the stumps of well-rounded inselbergs. The Saswad Plateau is a topographic continuation of Mahadeo Upland but it is detached from the latter by the entrenchment of the Nira, which with its tributaries has developed a large basin. The plateau confined between the Nira and the Krishna and furrowed in the centre by Yerla extends up to Bijapur. The Aundh Plateau and the Khanapur Plateau are the old surfaces of erosion at 850 m elevation. Much of this plateau is rocky and infertile with only kharif crops growing on the thin soils. A few tanks developed by putting earthen dams across small streams are used for irrigation, and permit a small acreage of winter crops. Settlements, few in number, are oriented to water courses all of which turn dry in summer, and the wells in the narrow beds of streams remain the only source of water. Villages are usually small, and with the sole exception of Vita there is not a single town on the plateau. Even the population of taluka headquarters does not approach anywhere near 5,000.

Upper Krishna Basin : It is one of the most fertile and well-watered agricultural areas of Maharashtra. Krishna, the lifeline of the region, confined between the Mahadeo Upland on the east and the Sahyadri spurs on the west, has collec-

ted a number of tributaries on its right bank. The valley, a broad trough at the source near Mahabaleshwar, broadens out down Satara into a large flood plain that fingers deep into the mountains along the tributaries. The economy of the region, essentially agricultural, is oriented to Krishna, its fertile flood plain and its water resources. Agricultural prosperity has promoted a number of agro-based industries and accounts for dense population and a moderate degree of urbanization. The valley from Satara to Sangli is the scene of intense agricultural activity and an overall economic development.

Historically, the axis of Maratha power held between Satara and Kolhapur, the two recognized seats of Maratha empire, the area witnessed many of the family feuds and manoeuvres of far reaching consequences. Even today it wields considerable influence of regional politics, and is known for its leadership and robust traditions of hard work and uncompromising attitude.

Agriculture, the main occupation of the people in the valley, is well-organized. The farmers are quite progressive and the prospect of better returns from cash crops like sugarcane and tobacco has brought them closer to modern technology. The crop distribution is largely guided by the fertility of the soil and the availability of irrigation. The most fertile land, the alluvial terraces, are generally given to sugarcane, the flood plains are covered with rabi-jowar and the outer zone of the valley merging with the pediments supports only inferior millets. Paddy is confined to the source regions of Krishna and Panchganga where the rainfall is higher. During the last two decades, there has been a considerable increase in the acreage under sugarcane to meet the demands of cane from the local sugar mills most of which are set up and run on a co-operative basis. This agricultural prosperity owes to the improved means of irrigation besides thick soils of the valley. The terraces sometimes carry as much as 10 m thick alluvium.

The sources of irrigation include tapping the subterranean water by traditional methods or by pumps, and using the surface water by throwing small earthen dams across the tributaries.

Krishna canal is the only organized source of large scale irrigation. In recent years lift irrigation, by pumping water either from the streams or from the tube wells sunk in the river beds, has become common. The completion of irrigation works on Krishna near Dhoni and on Warna near Khujgaon will add considerably to the existing irrigation facilities.

The valley has an industrial development parallel to its agricultural prosperity. The most important of the industries are the sugar refineries located in areas of sugarcane. There has been a speedy cooperative movement in the region and most of the sugar factories are owned and managed by farmers' co-operatives. The movement is spreading to other economic and social fields: Ogalewadi, Kirloskarwadi, Kolhapur, Sangli and Ichalkaranji are the industrial centres of the area. Ogalewadi has glass works, while Kirloskarwadi, a larger industrial complex, has casting works and specializes in agricultural implements and pumps; Sangli has a textile mill and a large sugar factory. Most of these industries are based either on the local raw material or are oriented to local markets.

One of the most populous regions of Maharashtra, the valley shows increasing concentration of population to the south with the maximum density of rural population in the State. Kolhapur, Sangli and Satara, the districts in the valley, have a rural population density of 416,324 and 326 per km² respectively. Intensive cultivation employs as many as 45 persons for each 100 acres of land. The rural settlements are large, often with a population of several thousands, and located on isolated rock exposures above the flood level. In Panchganga basin suitable village sites are few and this explains the large nucleated settlements situated well away from the river banks.²⁶ Life in these villages is well organized and they are significant socio-economic units with an agricultural base and having service institutions of their own. Kolhapur, Sangli, Miraj, Ichalkaranji, Karad and Satara are some of the important towns.

Kolhapur, the largest town of Krishna valley, and located in the centre of Panchganga basin, is the focal point in the economy of the region. Though a town of antiquity, it received the

necessary stimulus for its growth only after it became the seat of Marathas in 18th century. The town is arranged around the royal palace and the associated temple complex of Mahakali, all parts of the monumental quarters contained within the wall. Bounded on the north by the river Panchganga and its flood plain, which are subjected to annual inundation, the town grew to the south adding new elements in its frame including the Shivaji University. The city has a distinct culture based on Maratha traditions and supported by a prosperous peasantry in the countryside which retains the warlike qualities of its people often displayed in the folklore and the institution of wrestling. The area is known for *pawadas*, a kind of ballads, and the regional folk dance, called *iamasha*. Sangli and Miraj, the two towns, hardly 10 km apart, grew as the capitals of two States of the same name. The former has an industrial base in its sugar and cotton mills. During the crushing season the town is crowded with the endless caravan of bullock carts which bring the cane to the factories.

The region has a very well-developed network of transport. The two main routes, the Poona-Bangalore metre gauge railway and the Bombay-Bangalore route (National Highway No. 4) pass through the region, linking the towns and the larger villages by approach roads. Wai and Karad are the two important towns on Krishna, the former, a religious place, just where the river leaves the Sahyadri and enters the plateau. Karad on the confluence of Koyna and Krishna is a very old place and has since long controlled the route to Konkan via Koyna Valley. Today, the town has acquired a new look with its educational and technical institutions and the sugar mills in the vicinity.

The entire Upper Krishna Valley was shocked by a very severe earthquake with its epicentre near the dam site on Koyna in 1968, and suffered considerable loss of life and property. Since then the shocks have repeated several times, and the spectre of the Koyna earthquake looms large on the region.

Vidarbha Plain (Wardha-Wainganga Basin): The eastern part of Maharashtra, the Wardha-

Wainganga Basin is a zone of physical as well as cultural transitions. Here the basalt, so typical of Maharashtra plateau, comes in contact with the older crystalline rocks giving rise to granite-gneissic relief, different from the usual 'Mesa-and-valley' topography. The basin is enclosed on three sides by higher lands which carve out for it a distinct regional entity separated from the hilly Satpura on the north, the Maharashtra Plateau on the west and the Chhattisgarh Basin on the east. The basin as a whole comprises the Nagpur-Wardha Plain on the west and the forest-covered Wainganga valley in the south-east. Enjoying a rainfall heavier than the plateau of Maharashtra (more than 1,000 mm increasing progressively eastwards), the area is rich in natural vegetation that covers the rugged hilly land. A change in the structure and surface configuration with a concurrent increase in rainfall has changed the nature of soils, promoted a more luxuriant growth of vegetation and has thus changed the economy of the land.

Presenting a different physical milieu, characterized by forest-covered, rugged and unhealthy terrain, besides being away from the seats of powerful ruling dynasties, the area was a scene of periodic incursions and remained neglected till Chanda (Chandrapur) and Nagpur were developed by the Gond kings. With the rise of Maratha power, Nagpur became the seat of Bhonsale dynasty which was a strong bastion of Maratha confederation. The area rose into prominence with the development of railways and the reorganization of the country's administration by the British. Nagpur became the capital of Madhya Pradesh and improved accessibility made it the focus of transport.

The area once inhabited only by primitive tribes has experienced the impact of different cultures during the last three hundred years. The expansion of Maratha influence from the west on the one hand and the immigration of Hindi-speaking people from the Ganga Plain on the other, brought the two culture-groups together in which the former prevailed, supported as it was by the ruling Maratha dynasty. Ever since there has been a regular stream of migration from the north but more from the west because of political conti-

guity from Poona to Nagpur and the absence of any significant physical barrier. The cultural personality of the region has, therefore, resulted from a healthy marriage of two different cultures. Even after the creation of Maharashtra as a separate linguistic State the influence of Hindi-speaking north still persists though to a lesser extent on the politics of the region than on its social thinking and cultural traditions.

Wardha-Penganga Plain : The western part of the Vidarbha Plain, drained by the Wardha and the Penganga rivers and their tributaries, is what one may call the Wardha-Penganga Plain. Unlike the Wainganga basin, the plain is underlain mostly by basalt presenting the familiar trappean landscape of the plateau. The Wardha Plain is denuded so that its general elevation does not exceed 300 m a.s.l., though the plateau and the hilly areas on the north-west, culminating into the upland of Arvi, stand out from the plains. About two-thirds of the plains are cultivated having a crop distribution that varies with the soil. The black or medium black soil occupying the valley is most fertile, but *morand*, the grey soil, forms the most extensive cover that is suitable for cotton and jowar. From west to east, cropping pattern is progressively dominated by cotton, jowar and rice. In drier western part more than 40% of the land is under cotton. Dearth of irrigation has kept the yields low. Little of irrigation—not more than 5% of the cultivated area—that is available from wells is directed to fruit orchards and vegetables, particularly chillies. Wardha (49,113; 1961), though a satellite to Nagpur economically, is the administrative headquarters of the district. Yeotmal (45,587) is another district headquarters.

The Wainganga Basin : A structural syncline,²⁶ it occupies a crystalline base, having more than 1,500 mm of rainfall. Rapid fluvial erosion has reduced the land considerably leaving a number of isolated hills. Rocky surfaces, often devoid of thick soil cover, are usually covered with forests. The valley comprising the Nagpur, Chanda and Bhandara districts of Maharashtra accounts for more than half of the forest area of the State. Tropical Deciduous forests of Wainganga valley are the main source of timber and bamboo and support

the paper industry at Ballarpur. Soils derived from granitic decomposition are generally light, and with their low productivity are suitable only for kharif crops like paddy and kharif jowar. The winter crops are generally grown in black soils which support rabi jowar even without irrigation.

Because of forest cover and rocky terrain, particularly in the south, very little land is under cultivation and in some parts it is less than 20 per cent of the total area. Chanda and Bhandara have respectively 25 and 40% of their areas under cultivation, employing 70 to 80% of their population, while Nagpur is basaltic and fertile with two-thirds of area under cultivation, rice and jowar being the main cereals and orange and cotton the cash crops.

Much of the cultivated area is under food-crops. Unlike the dry and rocky plateau of Maharashtra, Wainganga Basin is richer in water resources, irrigating 15 to 25% of its cultivated acreage, mostly from tanks which account for 80% of the total irrigated area. The tanks, commonly known as *malguzari* tanks were developed long ago. Together, the districts of Chanda and Bhandara have more than 20,000 tanks. Too many tanks spread over the region have given this area the name "the lake district of Maharashtra" which, though justifiable, is misleading.

The lower part of Wainganga basin occupied by the district of Chanda is rich in minerals. The coal deposits associated with the lower Gondwana rocks occur in Wardha valley at Bandar, Waroda, Wun, Ghugus-Telwasa, Chanda and Ballarpur. In upper Wainganga valley there are deposits of iron ore, corundum and building stones. These minerals have, however, not promoted any local industry because the reserves are limited. Forests support a paper mill at Ballarpur and paddy-milling and 'bidi' making are the traditional industries.

One of the least populous parts of Maharashtra (47 persons per km² for Chanda), the lower Wainganga valley still preserves an unmutated natural landscape, with its forests, over 10,000 tanks covering an area of 40,000 acres, and the national parks. With a population of just over one million, spread over an area of more than

26,000 km², the district of Chanda appears underdeveloped. The people, a fifth of whom are scheduled castes and tribes, suffer from general economic poverty. Diarrhoea and dysentery are the common diseases in this part. The population settled in small villages has avoided the forests, and the distribution follows the river-sides. There are not many towns and urban population forms less than 10% of the total.

Chanda, now called Chandrapur, with a population of over 50,000 is the largest town of the Lower Wainganga valley. The city, once the capital of Gond, has not made much progress. It is a centre of timber trade and rice mills.

The northern part of Wainganga Basin (also known as Nagpur Plain) is less forested and has over half the area under cultivation despite the occasional hills. Paddy, the principal crop, covers more than 50% of the total cropped area. This comparatively more prosperous part of Wainganga Basin has a higher density of population. The plain is known for its oranges. Besides agriculture, the main occupation of the people, mining forms an important economic activity of the region. Bhandara district mines over 200,000 metric tons of manganese ore every year. Bhandara (27,710), a few kilometres away from the Central Railway, though a district headquarters, is not as important as Gondia which is an important centre of timber trade. Local production of cotton is utilized by the textile mills at a number of centres, notably Nagpur, Wardha and Hinganghat with the power received from Khaperkheda thermal plant. Though there are other industries like oils, machine-manufacturing etc., about half of the industrial employment is absorbed by textile mills.

Nagpur (643,659), the third largest town of Maharashtra after Bombay and Poona, is the regional centre of eastern Maharashtra. The town founded by the Gond kings in early 18th century attained prominence only after it became the capital of Central Provinces. The centrality of the place claimed for it an important place in the British organisation of Indian administration. To Maharashtra, Nagpur was always an outpost of Maratha empire and was known above every

thing else by its association with the Bhonsale dynasty. The town is divided into two halves by the railway line and has a number of lakes. The cotton textile industry has provided the city with a strong base around which other secondary and tertiary industries have grown.

A word must be said here about Vidarbha, a socio-political region comprising the seven eastern districts of Maharashtra. Generally known as Nag-Vidarbha region, it has certain problems of incomparability with the rest of Maharashtra. Its long association as a regional group with the erstwhile Central Provinces, much of which now forms the present Madhya Pradesh, has imparted

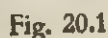
it a recognizable identity based on common interests. Having lost its importance as a pivotal area and linked up with the more prosperous western Maharashtra as a late appendage, the region nurtures a mood of dissatisfaction which feeds itself on the alleged domineering attitude of Maharashtra, which is accused of discrimination against Vidarbha. The discord in this case is intra-regional and stems from disparity in economic development. What is needed, therefore, is an understanding of the socio-economic phenomena and the rational development of bases and possibilities compatible with the needs and the resources of the area.

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Historical Background

While the twentieth Haihaivanshi king, Sur Deo was ruling at Ratanpur around A. D. 1000, his younger brother started ruling from Raipur in feudal subordination to his elder brother. Thus the kingdom of Chhattisgarh was divided into two parts during this period. The capital town of Ratanpur was founded by the Haihaivanshi king, Ratan Deo. Similarly, the capital of Raipur was established by Rai Brahma Deo. Of these two capital towns, Ratanpur is left as a village while



Raipur has grown into the premier city of eastern Madhya Pradesh. Each one of the thirty-six forts had an administrative territory around it, being in feudal possession of either the king's relatives or his other subordinate chiefs.

Until the Maratha invasion in 1741, the Haihavi-vanshi kingdom of Chhattisgarh enjoyed immunity from external attacks and there is evidence of great prosperity during the rule of the forty-fourth king, Raja Kalyan Sahi (A. D. 1536-1573). He was the first ruler of Chhattisgarh who brought this region under Moghul influence when he received a title from Akbar.

Chhattisgarh was under Maratha rule from 1741 to 1853, excepting a brief interlude (1818-1830) when it was administered under the British protection. The region completely passed over to the British rule in 1853.

During the British rule, Chhattisgarh was gradually divided into administrative districts. Raipur, Bilaspur and Durg districts continue to be the administrative units in the region from pre-Independence time. A new district, i.e., Raigarh, has since been formed by merging the princely States of Raigarh, Sarangarh, Jashpur and Udaipur. The Sakti State has been added to the Bilaspur district. Similarly, the Nandgaon, Dongargarh, Khairagarh, Chhuikhadan, Khamaria and Kawardha States now form the part of the Durg district. These reorganisations, by willing co-operation of the ruling princes, were completed by 1949 when the Chhattisgarh region assumed the present administrative form (Fig. 20.1).

The Physical Setting

Geology

The Chhattisgarh region is almost coterminous with the Cuddapah or Purana sedimentaries and the Archaean granites and gneisses exposed in the basin and the surrounding upland respectively. These flat to gently dipping sedimentary beds rest unconformably on the Archaean granites and gneisses. The basin boundary, at places, is formed by the metamorphic rocks belonging to the Chilpighat Series of the Dharwar System sandwiched between the overlying Cuddapah beds and underlying Archaean granites and gneisses. To

the north-east of the basin are exposed the Lower Gondwana formations containing coal measures among which the Korba fields of Bilaspur are well-known (Fig. 20.2).

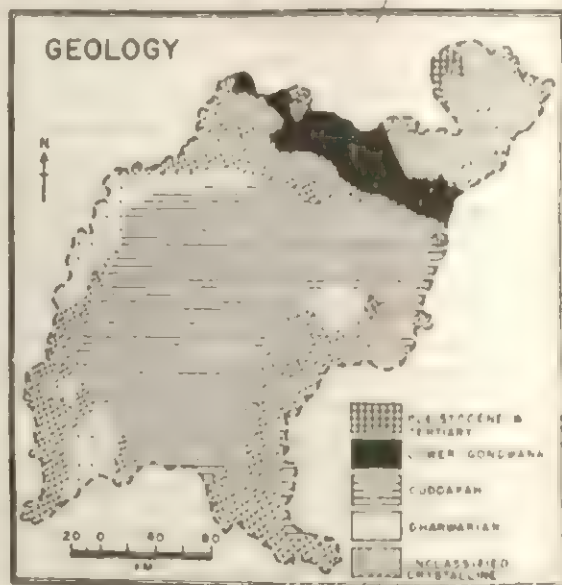


Fig. 20.2

Landforms

The Chhattisgarh region is characterised by two major land-form types, i.e., the gently sloping Chhattisgarh Plain and the undulating Rimland. The elevation of the Plain ranges from about 250 m on the eastern margin to about 330m in the west. The gentle gradient of the Chhattisgarh Plain is largely due to its geological structure with flat to gently dipping Cuddapah sedimentary formations. Around this Plain, the land rises steeply in almost every direction except the south-west where it merges gradually into the granitic and gneissic peneplain of the north-western Bastar district. Moreover, in the east, the Chhattisgarh Plain narrows down into a corridor between the Raigarh hills on the north and the Raipur Uplands on the south (Fig. 20.1), through which the Mahanadi flows eastwards between the Chotanagpur Highlands on its north and the Orissa Hills to the south.

Since the Mahanadi flows close to the south-eastern edge of the Chhattisgarh basin, the trans-

Seonath Plain in the north-west is far more extensive than the narrow trans-Mahanadi Plain in the south-east. The entire plain is dissected by a large number of streams emptying into the main river.

The Mahanadi river system has a nearly radial pattern in the Chhattisgarh Plain. Therefore, this plain is divided into a number of well-defined sectors, which may be named after the bounding rivers, i.e., the Mahanadi and its tributaries, the Seonath, the Hasdo and the Mand, etc. These interfluvial sectors generally present only slight surface undulations. While most of the area is covered by a veneer of soils, developed locally, one also observes some comparatively rugged areas of rock-outcrops littered with weathered rock pieces. Such occurrences are, however, too limited in area to be shown on a small scale map of the region.

It is notable that the Chhattisgarh Plain is fringed by some river basins which lie between the hills and the plateaus around it. Notable among these are the Korba Basin (Hasdo valley) and the Raigarh Basin (Mand valley) in the north, and the Kanker Basin in the south.²

The Chhattisgarh Plain or the Upper Mahanadi Plain is bordered on the north by a series of plateaus and hills in the northern parts of Bilaspur and Raigarh districts. The Maikal Range runs along the western border of the Durg and Bilaspur districts and rises sharply from about 450 m elevation at its foot near Chhuikhadan and Kawardha to about 700-900 m high crest-line. The northern wall of the Chhattisgarh basin is broken successively by the Arupa, the Hasdo and the Mand from west to east to distinguish the Lormi Plateau, Pendra Plateau, Chhuri Hills and the Raigarh Hills. The tops of these plateaus and hills rise to about 700-900 m, that is roughly comparable with the height of the Maikal Range on their west. On the south-east, the Raipur Uplands run parallel to the Mahanadi and lie close to it. These uplands rise from about 300 m at their foot to about 400-500 m at the top. In the extreme south-east stands the escarpment of the Bastar-Orissa Plateau which rises to a height of 800-900 m in the source region of the Mahanadi. Thus, the ramparts of

the Chhattisgarh region are formed by the hills and plateaus referred to above, excepting the granitic-gneissic peneplain on the south-western border, which is diversified by the Dalli-Rajhara Hills in the southern part of the Durg district. These hills rise sharply from 450 m to about 600 m.

Drainage

The Mahanadi river system collects practically all the rain water of the basin and carries it to the Bay of Bengal (Fig. 20.3). The volume of water in this river system varies considerably between the rainy and the dry seasons.

The Mahanadi rises in the Sihwa Range and after collecting a number of streams in the Kanker tahsil (Bastar district), traverses the Raipur district in north-easterly direction for about 204 km until it is met from the west by a major tributary, the Seonath. Then it flows eastward until it leaves the Chhattisgarh Basin at the eastern margin of Raigarh district. The right bank tributaries of the Mahanadi are rather small, notable among which are the Pairi, the Sukha and the Jonk.

The various rivers which rise on the highland rim of the Chhattisgarh Basin make numerous falls while descending into the basin. At places, they cross the highland border through narrow gorges where they may be conveniently dammed to store water in reservoirs for irrigation.

It may now be observed that drainage system divides the Chhattisgarh Plain into seven physical units: (i) The Mahanadi Seonath *Doab*, in the south-central part (ii) the trans-Seonath Plain, (south) facing the Maikal Range in Durg district, (iii) the trans-Seonath Plain (north), facing the northern uplands in Bilaspur district, (iv) the Hasdo-Mand lowland tract in the north, (v) the Raigarh Basin in the north-east, (vi) the trans-Mahanadi Plain (south), west of the Raipur Uplands and finally (vii) the trans-Mahanadi Plain (north), being north-east of the Raipur Uplands.

Climate

According to Koppen's classification, the region, possesses the Aw or Tropical Rainy climate with dry winters. Here the temperature varies



Fig. 20.3

from 19.9°C in the coldest month, January to 34.7°C in May which is the hottest month.⁸ This gives an annual range of temperature amounting to 14.9°C , which is strikingly high, because of the interior location of the region.

The distribution of annual rainfall in the Chhattisgarh region is clearly influenced by topography. There is a minimum of about 100-120 cm in the Seonath Valley. The rainfall increases to 160-180 cm over the Raigadh Plateau and the Mahul Range. The uplands in the south and

east also get above 140 cm. However, the continuance of the medium rainfall axis north of the Seonath to the Pendra Plateau area (120-140 cm) can be explained with detailed observations which are not available at present (Fig. 20.4).

The rainfall at Raipur station totals 130 cm for the year. About 95% of it occurs between June and October. The uplands are far cooler than the plains. During the summer season, while the plain of Chhattisgarh is extremely hot and scorching, the plateaus and hills are pleasantly

cool. In the rainy season when the clouds are condensation rain, the humidity is very high, and the weather is up to the point of being unbearable. When in the winter the heavy rain is necessary cool, the highlands become fairly cool.



Fig. 2.4

The coastal belt of Chittagong District is rather small, but it is the largest source of the district's revenue, which can be seen from the fact that the revenue of the district is more than 50% from the coastal belt. The coastal belt is the seat of the district's commerce and industry, and it is the source of the district's population. The coastal belt is also the source of the district's culture and education.

Natural Vegetation

Over the greater part of the Chittagong District the original forest has been cleared, and the land is now in agriculture. In the remaining forest areas, however, the vegetation is still in the state of nature. The forest is the source of the district's timber, and it is the source of the district's fuel. The forest is also the source of the district's food and medicine. The forest is the source of the district's culture and education.

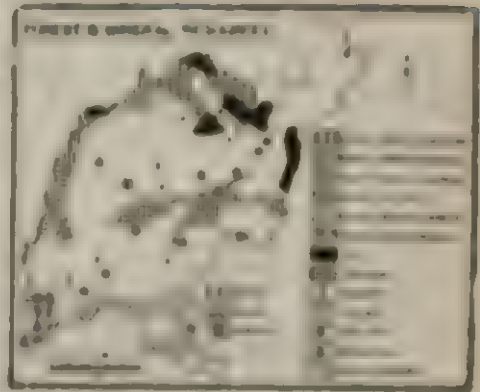


Fig. 2.5

The natural forest is the source of the district's timber, and it is the source of the district's fuel. The forest is also the source of the district's food and medicine. The forest is the source of the district's culture and education.

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house building, etc. The *bijasal*, *sal* and *mahua* etc., are other trees commonly felled in timber extraction. The *tendu* provides valuable leaves for 'bidi', the *sal* and *achar* produce adhesive gums, the *barra* fruits give valuable tan-stuff, the *palas* and *kusum* trees grow lac from which shellac is made, the *khair* provides catechu so common for use in chewing betels and the *mahua* flowers are edible sweets and on fermentation they give an intoxicating spirit that is a very common drink in this region. The *mahua* pods contain an edible as well as industrial oil, while valuable dry fruit, *chironji* is produced from the *achar* tree. The *bagai* or *bhabar* grass is also important as a raw material for paper pulp. The forests of Chhattisgarh also grow the *Tassar* silk cocoons on certain trees.

Soils

In an all-India Scheme, the Chhattisgarh Plain has chiefly the Tropical Red and Yellow soils, developed *in situ*. Alluvial soils, if any, are confined to the floodplains of the large rivers. The parent rocks in Chhattisgarh are the Cuddapah shales and limestones as well as some sandstones in the plain area while the uplands contain mostly the granites and gneisses. The red colour that prevails in the soils here is due to the diffusion of the iron contained in these parent rocks. The process of soil formation in the Chhattisgarh Plain is laterization, though not so marked as in the Tropical Rainforest climate. The vegetation cover being the broadleaved deciduous forests, much humus is not contributed to these soils. This is another reason for the prevalent light colour of the soils. The coarseness and low humus content of these soils explain their low fertility. The soils of the region show their deficiency in important mineral nutrients like calcium and magnesium, etc. and poverty in nitrogen, phosphorus, lime and potash, which are more concentrated in the lower part of the soil profile.⁶ However, the Tropical Red and Yellow soils or the red sandy soils of the region possess suitable textural conditions for growing rice and millet crops.

It is important to understand that the soils of

the Chhattisgarh Plain vary greatly according to topographical conditions. The uplands have generally lateritic soils and they also clearly show the development of some patches of laterites at some platform type of sites. Here the soils are deeply red from which red ochre may be obtained, while they are almost useless for cultivation. There are certain places among these where iron concentration is sufficient to support some indigenous iron-smelting industry. In depressions and on the lower flats, where drainage is checked and finer particles washed down also collect, the soils have darker hue, ranging between brownish and blackish.

The common soil types are as follows : (i) *Kanbar* : A deep and dark bluish black soil which is generally found in lowlying situations. Although different from the well-known black cotton soil (which is developed on basalt or the Deccan Trap) this soil resembles that in being soft and sticky when wet as well as in having a remarkably high moisture-retaining capacity. It is, therefore, natural that *Kanbar* soil is particularly suited for growing wheat and other *rabi* crops.

(ii) *Matasi* : A yellow sandy soil with some admixture of clay. It occupies comparatively higher and better drained areas. The workability of this soil is easy due to its lighter texture and more pliability. Thus it is considered quite suitable for growing rice.

(iii) *Dorsa* : An intermediate variety between the *Kanbar* and *Matasi* which may be considered as a loamy soil. Its colour is between brown and yellow. This soil is considered a general-purpose soil, suitable for most varieties of crops.

(iv) *Bhata* : A sandy and gravelly soil, generally occurring on the upland-tops. It is recognised by its coarse texture and red colour. The finer and more productive mineral particles as well as much organic matter have been washed down-slope from this soil site and it is left quite poor in fertility. Hence, it favours only the coarse millets. On the other hand, the *bhata* areas at places lying waste are potential-industrial sites, such as utilised by the Bhilai Steel Plant.

The alluvial soils of Chhattisgarh Plain are confined to narrow belts flanking the river channels

and naturally they would be more extensive along the bigger rivers, particularly the Mahanadi. The annual floods in these rivers replenish the fertility of their alluvial soils and so they are generally more fertile than the neighbouring soils.

Mineral Resources :

The Region is notable for its useful rock and mineral resources, particularly limestone, dolomite, bauxite, coal, fire clay, iron ore, manganese, galena, other lead ore, graphite, quartz, fluorite, calcite and various building materials (Fig. 20.5).

Of prime importance among these is the vast occurrence of limestone in the Cuddapah formations which is suitable for cement making, as at the Mandhar Cement Factory near the city of Raipur. Limestone quarries are dotted in the Chhattisgarh plain e.g. at Telibandha, Rawanbhatta, Mahadeoghat and Khushalpur on the periphery of Raipur city and at other places in this district, Akaltara and Jairamnagar etc., in Bilaspur district, and the Nandini mines (with 21 million tonnes reserves) which supply to the Bhilai Steel Plant.

The occurrence of dolomite is associated with that of limestone in the middle of Chhattisgarh plain. Notable reserves of this are near Bhatpara (132,000 tonnes) in Raipur and near Khaira, Ramtola, Hirri, Parsoda and Bhanesa (69 million tonnes) in Bilaspur.

Bauxite occurs near Korba (reserves : 50 million tonnes) in Bilaspur where an aluminium plant is being set up. It is also reported to occur at village Bhavi in Rajnandgaon tahsil (reserves : 1 million tonnes) in Durg.

Iron ore occurs in the Dalli-Rajhara and Jharandalli areas (reserves : 114 million tonnes) on the south of the Chhattisgarh plain. This is the source of raw material for the Bhilai Steel Plant close by. The occurrences of laterites used for indigenous iron-smelting may be mentioned at Nandinitola, Akalberia and Rajdhar villages of Durg district as well as at some places in Raipur district.

The basin has also notable deposits of coal belonging to the Gondwana formations. These

deposits occur in an area about 520 km² between the Mahanadi and the Brahmani. The most notable Korba coal fields are located in the Hasdo valley in Bilaspur. The coal seams are very thick as is exemplified by the Jatraj seam (45 m) and the Ghordeewa seam (40 m). The Ghordeewa seam contains 70 million tonnes of coal and 60% of it is of coking quality. The total estimated reserves in the Korba coalfields are about 250 million tonnes of which 221 million tonnes are of superior grade. The ash content of the coal is about 40% as in the Jatraj seams. Coal also occurs in the Raigarh district in the lower Brahmani valley with 4 to 6 m thickness (ash content between 33% and 45%). Further south, Domhatea coal field (2 m thick seam) have inferior coal. In south Raigarh, the Deoduria coal with a reserve of 430 million tonnes is also inferior.

Clay is found in 1.5 to 3 m thick beds in Kohniama Nala, Motinagar, Sonamurdi, Mahuadih and Dhajag Nala in Bilaspur. It also occurs in Nandini and Moradabra villages in Durg district as well as on Kharun bank in the vicinity of its rail bridge in the Raipur district. Fire clay occurs at Kharsia and Chintapanigaon near Raigarh.

Quartz veins outcrop in the districts of Raipur and Bilaspur. Gold is found in the Khairagarh tahsil of Durg as well as in the Jonk river in Raipur district. Manganese ore is found in Bilaspur while lead ore occurs in Chandini Dongri near Bemetra in Durg. This district also contains graphite, calcite and fluorite.

Among building stones, slates occurring at Ghorari village and Rajim near the Mahanadi river are notably good for slab making. Slate quarries exist in the Mahasamund tahsil of Raipur.⁷

Physical Resource Base

The soils of Chhattisgarh plain will be considered as its principal natural resource on which the predominantly agricultural population of this region depends for its mainstay. It is because of its soils and a favourably hot-humid climate that Chhattisgarh plain is called the rice-bowl of Madhya Pradesh.

The mineral wealth of this region seems to be

its second important natural resource. Limestone, bauxite, iron ore and coal may be called the four pillars on which the Chhatisgarh region has just started to build its edifice of basic industries of cement, aluminium and iron-steel. In comparison to soils which have exhausted with age-old cultivation without adequate fertilization, the mineral resources of this region still remain largely unexploited, and they hold out a promising future.

The forest resources are of potential importance in the upland rim where they have survived and certainly hold out prospects for lumbering, paper, shellac and other industries.

The rivers converging in the Chhattisgarh Plain constitute important surface water resources for irrigation, industrial and urban water-supply as well as for power generation. However, the seasonal concentration of rainfall necessitates the construction of valley-dams to create sufficient reserves of ground water resources, as revealed by ordinary and tube-wells bored in the Chhattisgarh Plain. It is, however, worth remembering that the utilization of this resource is considerably expensive here because of the necessity to blast the rocks below the shallow layer of soil in order to dig the wells. Similarly, the boring of tube-wells is both difficult and expensive. Another drawback is that the shallow wells and little tanks which are common in this region soon dry up in the hot season when their service is most required.

The Cultural Setting

Population

The population of the Region numbers 6,950,259 (1961 census), which is about 21.47% of the population of Madhya Pradesh in 17% of its area.⁸ This concentration of population is explained by its largely level surface, rice-culture and the recent industrial developments. While the plain is generally well settled, the uplands have their population generally clustered in the few forest clearings. The rivers of the region, even the larger ones, fail to attract heavy concentration of population mostly because of their non-perennial and torrential nature. Tanks being more con-

venient to approach than the river beds, attract population clusters. The roads and railways have provided some important sites for the establishment of towns and villages. And more recently, the mineral resources like iron ore, limestone and coal have provided incentives for the establishment of rising towns like Bhilainagar, Rajhara, Nandini and Korba, etc.

The density of population (1961) in the Region is 96 per km² varying from 100 in Bilaspur and Durg to 97 in Raipur and 88 in Raigarh in comparison to 77 in Madhya Pradesh as a whole (Fig. 20.6). Density of population by tahsils shows wider ranges, from 200 in Sakti to 55 in Katghora. The tahsils with high densities, (160-240) are Sakti (200), Janjgir (180), Bilaspur (175), Durg (181) and Raipur (173). This high density obtains mostly because of urban concentration. Low density (below 80) occurs in Katghora, Dharamjaigarh, Chorghora, Jashpur, Kawardha, Khairagarh, Balod and Bindranawagarh largely due to the ruggedness of terrain and forest cover.

Trend of Growth : The population of the Region has more than doubled from 3,365,721 in 1901 to 6,950,259 in 1961 which is slightly higher than that of Madhya Pradesh. The 1901-1911 decade witnessed spectacular growth (22.29%) in contrast with the slow growth rate of the country as a whole (5.73%) mainly because of its relative immunity from famines and epidemics which in its turn also accelerated immigration. During the second decade (1911-1921), the region increased by about 2% while it decreased by 1.39% in Madhya Pradesh and by 0.31% in India.

The increase was higher during 1921-31 when the region recorded a population rise of 13.22% while in Madhya Pradesh it was 10.78% and in India 11.01%. Somewhat the same trend continued during 1930's also.

The increase in transport facilities, urbanization, etc., contributed to sustained growth of population.

During the decade 1941-51, the growth rate of population in Chhattisgarh region was only 7.30% as compared to 8.31% in Madhya Pradesh while India as a whole recorded a higher growth rate of

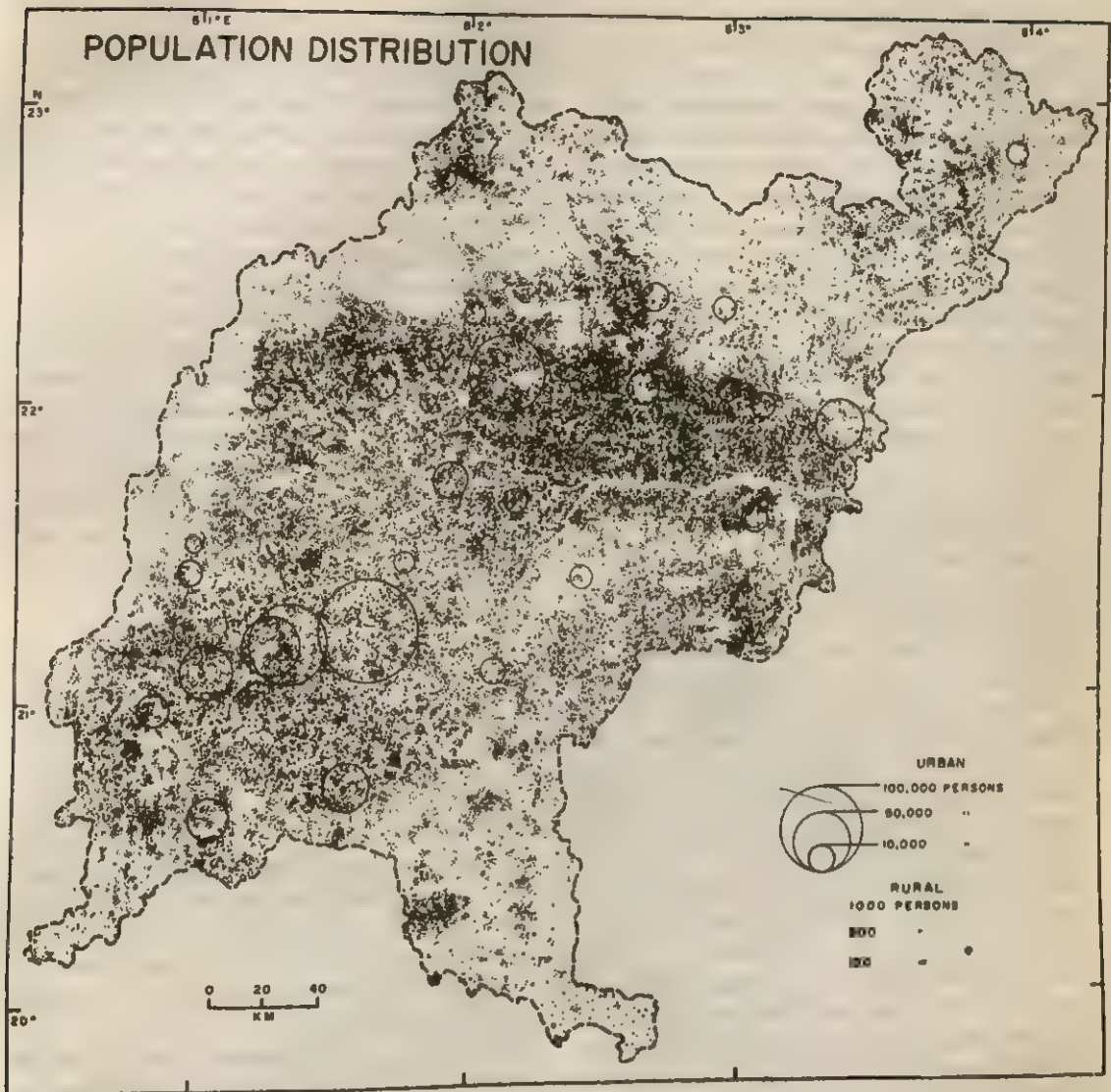


Fig. 20.6

13.31%. This slower growth rate in the region was mainly due to relatively little improvement in health services and living conditions.

The next decade, 1951-61, showed a notable growth (21.49%), almost equal to the all India average (21.5%), the main contributory factors being developments in industry, transport and trade in addition to the improvement in health services. The Bhilai Steel Plant was established in this period, leading to the rise of a new town

of considerable size, largely by the immigration of population. Raipur town also grew much under the influence of the Bhilai steel industry. Other new population centres have also grown during this period, like the Dalli-Rajhara iron mining township and Korba coal mining and power production centre.

It will be observed that during 1941-61 the population of this region increased by about 46%. There was some accrual of displaced persons from

Pakistan (West Punjab and Sind) in the region. The Bhilai Steel Plant also brought in considerable people into this region. Though the recurrence of such large migrations cannot be foreseen, it is likely that the development of mineral and forest industries in this region may further lead to considerable immigration in Chhattisgarh. So far as natural increase is concerned, it is difficult to say whether the present trend of rising agricultural prices and increasing immunity from disease would speed up the natural increase or the family planning campaign would cut it down. Considering that these two opposite factors may balance each other until 2001, the population of this region would probably be doubled during 1961—2001.

Sex Ratio : The sex ratio is characteristically high (1,166) in the region as a whole, although the Durg district (993) is exceptional, where the development of the Bhilai Steel City attracts relatively higher number of male-workers. The high sex-ratio has a stronger tendency in rural areas being still devoted to traditional economy.

The sex ratio shows variations from one age group to another. Females exceed males in the age groups of 0-9, 20-24, 40-44 and above 55 years. It appears that female children survive less than male children in the age of 10 to 14 years. This is clear from the fact that the excess of females above males in the age group 0-9 years is balanced by the deficient female population in the next higher age-group, 10-14 years. The next tier of female excess over males is in the 20-24 age-group, which indicates that females fare well for some time on getting married. But the nearly 40,000 excess female population in this age-group is levelled off in the two next higher age-groups, 30-34 and 35-39 years. This may be related to the loss of female population due to great strain of work and child birth. The greater number of females above 55 years reveals that the females surviving after 40 years of age have greater longevity than males.

Population as a Resource Base : With about 7 million population, the human resource is considerable in this region. A little over half of this population is female. These people are mostly

rural inhabitants. They are generally unskilled and the percentage of literacy is quite low, particularly among the middle age and old age-groups, more so among the females. For agriculture, however, this human resource is important due to its long experience and hereditary know-how of this traditional occupation. Unfortunately, however, these people suffer from weak constitution, frequent ailments and a tendency to shun work that would bring only a small emolument. They are content with their austere life and a minimum standard of living which therefore persists. However, education is now spreading and technical training institutions have also grown recently to improve the human resource of the region. Employment opportunities have not kept pace with growing education and this has created much unrest among the educated and trained people.

Settlements

Of the 13,566 villages in the Region, only 7% have 1,000 or more population. Over two-thirds are of small size (below 500), while about one-fourth is of medium size (500-1,000).

Usually, the villages are found to contain a number of hamlets or sub-villages. Quite often a hamlet is inhabited by a particular caste. Often a hamlet may grow for the facility of proximity to the agricultural fields from the residence of the owner-cultivators. It is also considered that hamlets represent the early stage of the evolution of a village, just as many villages form the nuclei of future towns.

The villages are generally formed of houses grouped in an irregular manner. They may be sited on relatively higher ground near some stream or rivulet. Each homestead consists normally of a few detached huts of mud walls and thatched roofing huddled around tanks and water holes for the facility of domestic water supply. The village chief's house is prominently located. Some villages are settled in a linear way along tracks, roads or river levees.

There are 30 towns of varying sizes in the region which have sprung from villages and are important service centres. Quite a good num-

ber of them have originated as fort towns being located at strategic points. Raipur, Raigarh, Sarangarh, Khairagarh, Rajnandgaon, Kawardha, Udaipur, Jashpur, Sakti, Chhuikhadan, etc., were the places where the ruling princes lived with their protective forces and administrative officers. To these centres were attached the commercial functions also. Over the administrative-defence and commercial functions were superimposed some manufacturing and transport adjuncts. As expressions of regional economy, some centres have developed special functions. For example,

Bhatapar in Raipur district has developed as the biggest rice-milling centre of the region. Raipur city also has a number of rice mills. Bilaspur is the divisional headquarters of the South Eastern Railway and is an important railway junction, thus having transport as the most important function. Dhamtari is notable for its collection of timber and other forest produce of the neighbouring Bastar district and has added trade and other less important functions.

Among all the service centres and, in fact, all the towns of the Region, Raipur is the premier

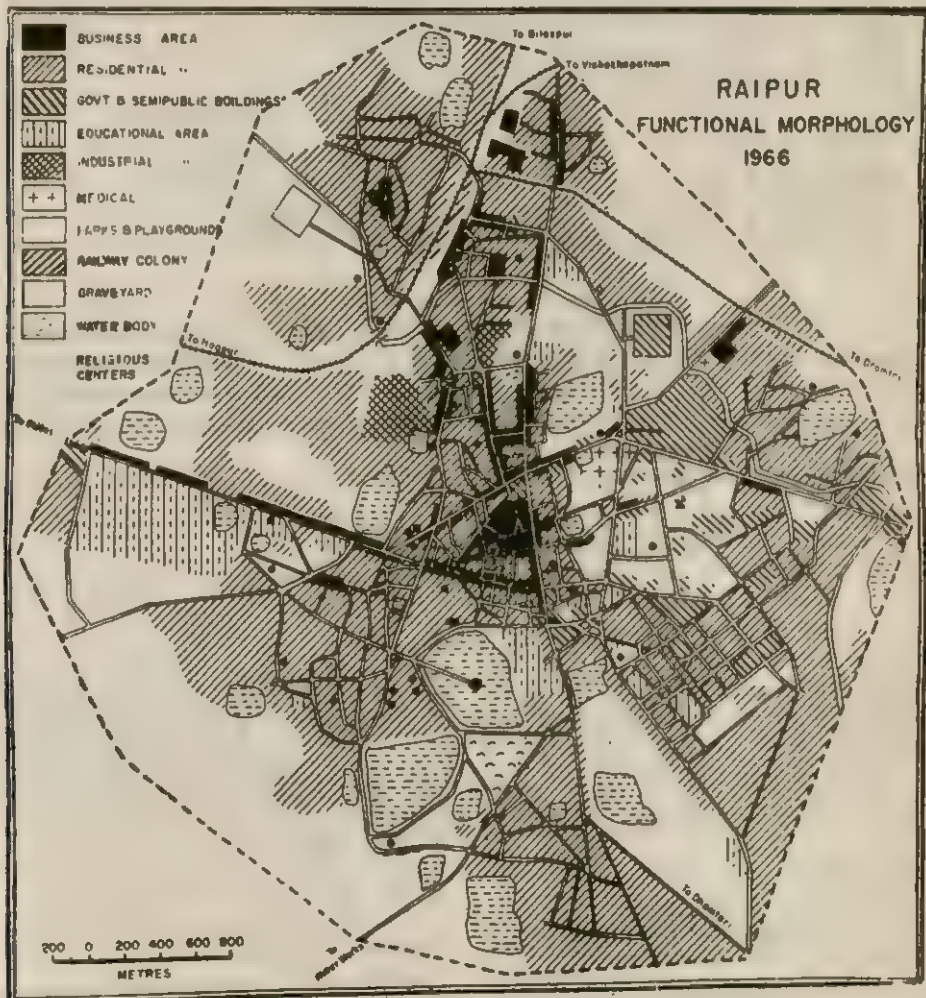


Fig. 20.7

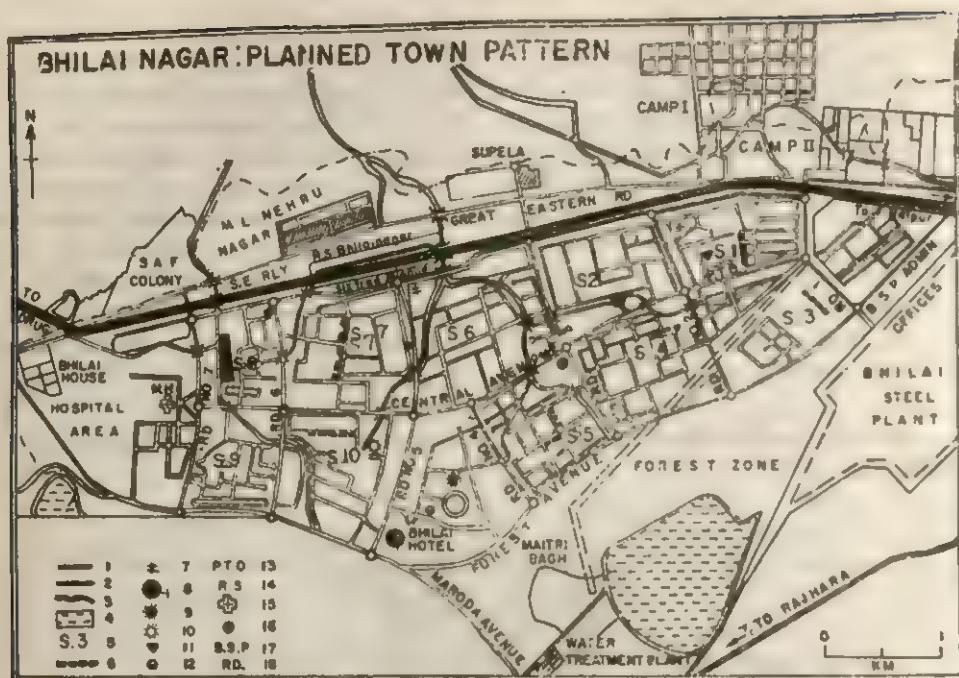


Fig. 20.8

1. Road, 2. Railway, Double Broad Gauge, 3. Stream, 4. Water tank, 5. Sector 1 (Similarly upto x), 6. Shopping centres, 7. Vishramgrih (Rest house) 8. Bhilai Hotel, 9. Chitramandir (Cinema), 10. Open Air Theatre, 11. Nehru House of Culture, 12. Bhilai Club, 13. Post and Telegraph Office, 14. Railway Station, 15. Maternity Hospital 16. Public Hospital, 17. Bhilai Steel Plant, 18. Road.

city and may be called the regional capital (Fig. 20.7). This is also the seat of the Ravishankar University serving eastern Madhya Pradesh.

The second prominent urban centre is Bhilainagar which together with the neighbouring district headquarters-town, Durg, forms the Durg town group (1961 pop. 133,230). This steel centre started to be constructed in 1956, and its own population now (in 1970), apart from Durg, appears to have qualified it for the status of class I city. Bhilainagar is notable for being the largest planned town in the Chhattisgarh region (Fig. 20.8).

Urban Morphology

The urban centres in Chhattisgarh Plain are unplanned excepting Bhilainagar, Rajhara, Nandini (township), etc.

Raipur : It is an unplanned city with the exception of newly planned residential colonies,

such as Panchsheelnagar, New Panchsheelnagar, Shankernagar, Vivekanandnagar and Choubey colony, etc.

The railway line (Bombay-Calcutta) flanks Raipur on the north, beyond which is the Gudi-hari wholesale area. From this line branch the broad gauge Waltair line and the metre gauge Dhamtari line on the east. The cultural landscape is visibly marked by a multitude of water tanks occupying the depressions within the city limits. Among these the Burha Talab is worth mention due to its great extent. Other notable tanks are the Teli Bandha on the east and the Maharaj Bandha on the southwest (Fig. 20.7).

The unplanned layout of Raipur and its narrow streets have given rise to much traffic problem. There is much congestion and accidents are very common on these roads. Unfortunately the dilapidated parts of the city are being rebuilt with-

out any overall plan which could improve the road system.

Bhilainagar is fully planned. It is divided into ten sectors, demarcated by major roads. The total town-space forms a sort of triangle with its base on the Six Tree Avenue which runs east-west along the railway line and the road between Raipur and Durg. The apex of the triangle is at the Stadium where the Maroda Avenue and the Forest Avenue converge in the south. Between this apex and the most heavily populated Sector VI on the north lies the Civic Centre of Bhilai-nagar. The main artery is the Central Avenue running east-west between the Civic Centre and Sector VI. Major roads cross the Central Avenue and thus separate the generally quadrilateral-shaped sectors referred to above. Large open spaces around the low density, mostly single storey residences in these sectors give this town the look of a 'garden city' (Fig. 20.8). These sectors are slowly being filled up with residential, educational and commercial buildings, streets and parks etc.

On south-east of the triangular residential area lies the Bhilai Steel Plant which is separated from it by the Maroda Water Tanks which are used to cool this plant. Near these tanks is the beautiful 'Maitri Bagh' (garden of friendship).

Economy

Agricultural Economy : The Chhattisgarh Region is prominently an agricultural area. In fact, the prosperity of this region depends on the production of the rice crop which predominates here. About 81% of working population is engaged in agriculture. The agricultural economy is characterised by subsistence farming. Cultivators constitute about 60% of the working population, while about 21% more are engaged in agricultural activity as cultivating labourers, etc. Only about 6% of the population is engaged in industry, 2% in trade, 1% each in construction and transport, and 5% in various services.

Arable land (43.3%) and forests (34%) constitute the two largest land uses in the region. The fallow land covers another 4.2% of the total

area while pastures and grazing land account for 7.8%. The area under tree crops and groves is only 0.03%.

The Chhattisgarh agriculture depends largely on rainfall, since only 11.6% of the net sown area is irrigated. This percentage varies appreciably from one district to another (Raipur : 20.2, Bilaspur : 11.0, Durg : 10.0 and Raigarh : 1.0). The low percentage in Raigarh is chiefly due to its rugged terrain.

About 30.6% of the net sown area is double-cropped. The gross cropped area in 1964-65 was 10,295,160 acres of which 88.9% was under food crops. Rice is the principal crop, occupying 51.8% of the gross cropped area or 67.6% of the net sown area. This region is known as the 'rice-bowl' of Madhya Pradesh exporting considerable quantities of rice. That the non-food crops occupy only 11.1% of the gross cropped area shows the insignificant place of industrial crops in the economy of this region. Among the cereal crops, rice is followed by maize, wheat and millets, particularly *kodon*.

The area under pulses is about 27.6% of the total food crop area. Fruits and vegetables grow over only 1% of the food crop area.

Among the non-food crops oilseeds predominate, constituting 96.5% of the non-food crop area. The linseed is the principal oilseed followed by *til* (sesamum), groundnut, rape and mustard. Fibres covering 17,976 acres are of little significance. Cotton is mostly confined to the Raigarh Uplands whereas the hemp is scattered.

To meet the increasing demand, culturable waste and fallow lands can be brought under plough for food crops. The increase in per hectare yield of foodcrops grown in this region would also be possible through more manuring and increase of irrigation, protection of plants, improvement of seeds etc. The use of 'Taichung' variety of paddy has recently shown greater yield. Chemical fertilizers are also being increasingly used in the region under 'grow more food' drive. There is 1 hectare of land per head of population in the region. Of this, the present net sown area is about 0.4 hectare per person.

The land use and crop pattern map of Lātuwa village gives an example of agricultural landscape in the Chhattisgarh Plain (Fig. 20.9). The main

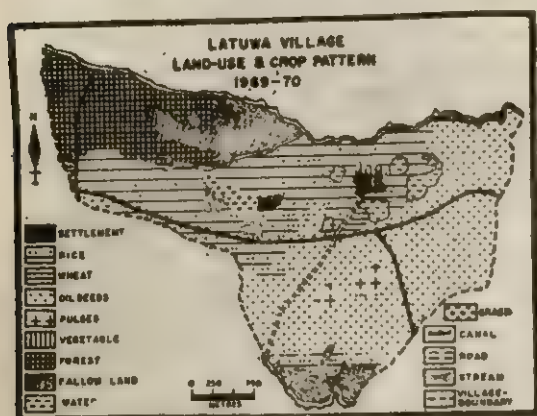


Fig. 20.9

settlement is situated near the tahsil headquarters of Baloda Bazar in Raipur district on an unmetalled road. Another hamlet is about a km to the west of this main settlement. The northern section of the village, lying between the Baloda Nala and its southern tributary nala is largely under forests and fallow. The rest of the area is mostly arable which is mostly under rice in the kharif season. Nearly half of the arable land is double cropped, being largely under linseed in the rabi season. Among other rabi crops the *tinra* (an inferior pulse) is somewhat extensive while other pulses and wheat and vegetables are of minor importance.

The arable land is irrigated by a distributary of the Mahanadi canal. There are several tanks near the village settlement for use, particularly by the cattle. Between the hamlet and the forests is the grazing land. The different parts of the village lands are linked to the settlement by means of a somewhat radial system of cart tracks.

The Chhattisgarh Plain may be contrasted with its upland rim in the matter of principal crops. The plain is predominantly under rice, while the rimland has a higher proportion of millets and *til* due chiefly to coarser and poorer soils. Secondly, the uplands are mostly inhabited by tribal people still sticking to the traditional agriculture. Fur-

ther, the rimland suffers from lack of irrigation facilities.

Industrial Economy : Agricultural raw materials form the main base for the industries in the Region. Next in order of importance are the forest products and the mineral resources. In fact, the mineral base is of far greater importance to potential industry.

There are in all 643 registered factories in the region, of which 307 are agro-industrial units, 162 are forest-based and 64 mineral-based. The remaining are of miscellaneous type.

Pattern of Development : The processing of foodstuffs, chiefly cereals and pulses is the principal type of agro-industries. Then comes the extraction of vegetable oils. Among forest-based industries the timber, lac and *insur* are important. Iron, steel and cement manufacturing and thermal power generation are the principal mineral-based industries. Certain miscellaneous metal and chemical manufacturing industries are also in existence.

The principal agro-industry of Chhattisgarh Plain is rice milling. There are 258 rice mills located mainly at Raipur, Bhatapara, Bilaspur, Raigarh, Kharsia, Dhamtari and Rajnandgaon etc. There are about 100 rice mills in Raipur district alone. The city of Raipur has a newly established highly automatic rice mill which is one of the biggest in the country. While paddy is collected from the local and neighbouring *mandis* by these rice mills, power used is thermal electricity produced at Korba in Bilaspur district.

The region has relatively quite a small number of registered *dal* mills (25) and grain-and-flour mills (7). The milling of *dal* is mostly centred at Raipur, Bhatapara, Bilaspur, Kharsia and Rajnandgaon. The largest concentration is in Raipur district followed by Durg. Raipur and Bhatapara are also the principal centres of grain-and-flour mills. The oil mills number only 13. The oil-extraction industry is located chiefly at Raipur, Bilaspur, Durg, Bhatapara, Raigarh and Dhamtari.

Rajnandgaon in Durg is notable for its Behgal Nagpur Cotton Mill. Bilaspur has got a spinning mill (1963) with 12,064 spindles, likely to be

increased to 25,000. The handloom weaving of cotton is widely dispersed in Chhattisgarh Plain engaging about 20,000 workers. Handloom weaving is fairly concentrated in the Raigarh district with 3,650 workers.

There are 32 saw mills in the region, chiefly at Raipur, Durg and Bhilainagar. The Raipur and Durg districts together have 21 saw mills, followed by Bilaspur (7) and Raigarh (4). Raipur is notable for a wood seasoning and timber treatment plant. There are 32 registered units of lac industry, 26 being located in Bilaspur district alone. Champa in this district is the most important centre, followed by Bilaspur, Sakti, Akaltara, Pendra, Jajgir, Rajim, Nawapara and Dhamtari. The region is also known for its export-oriented *tusser* ('kosa') industry, mainly located at Champa, Bilaspur, Mungli, Sakti and Chandrapur. Although the reeling of *tusser* cocoons is found as a house-hold industry, two modern centres of improved reeling have been recently opened at Koni near Bilaspur and Seoni near Champa. *Bidi* is made by 102 registered units located in the districts of Raipur (41), Raigarh (33), Durg (17) and Bilaspur (11), centred mostly in urban areas.

The iron and steel manufacturing is the principal mineral-based industry, Bhilainagar being the only centre. The main locational advantages are the Dalli-Rajhara iron ore deposits nearby and the Tandula canal for water supply and the Bombay-Calcutta broad gauge railway line. The Rajhara deposits have 114 million tonnes of iron ore reserves with 69% metal content. This ore is brought to the steel plant by a recently constructed railway (90 km) branching from the Bhilai junction. Limestone is also available nearby at Nandini (26 km), and dolomite comes from Hirri (209 km) in Bilaspur district. Coking coal is obtained from Jharia (725 km), with which a partially coking coal obtained from Korba (238 km) is blended. Manganese is brought from Balaghat (226 km) and Bhandara districts. Electric power is supplied from the Korba thermal power station.

The Bhilai Steel Plant makes mostly rails and structurals. It also supplies pig iron to the foundries

and billets to the rolling mills, located at Kumbhari, Raipur and other places. The production capacity of the Bhilai Steel Plant is 500,000 tonnes of rail, 250,000 tonnes structurals, and 600,000 tonnes of various merchant products like rods, beams and angles.

A number of steel rolling mills have sprung up in the region, particularly between Raipur and Durg to take advantage of the proximity of the Bhilai Steel Plant. Many units make tools and utensils etc., from iron, brass and aluminium metals on a small scale. The principal centres for these are Raipur, Durg, Bilaspur, Dhamtari, Raigarh and Rajnandgaon.

Among the miscellaneous industries, mention must be made of the bye-product industries of the Bhilai Steel Plant, like that of coal-tar, sulphuric acid, benzol and ammonium sulphate, etc. These bye-products are the basis of various chemical industries. The cement plant at Bhilai is similarly a bye-product industry. The production of ammonium sulphate at Bhilai is 6,000 tonnes annually. The capacity of the sulphuric acid plant is 12,000 tonnes. Another centre for chemical industry in the region is at Kumbhari where the D.M.C. makes some 40,000 tonnes of superphosphate and 15,500 tonnes of sulphuric acid. Other plants based on the bye-products of Bhilai are located at Raipur, Durg, etc. A variety of engineering industries have also developed in the region which use the iron produced at Bhilai. These are foundries, hardware industries, vehicle industries, etc.

Potentials : We have seen that agro-industries, particularly the rice mills, are well-developed in Chhattisgarh Plain. It is, however, estimated that with the increase in agricultural production and the development of the transport means, these industries would further develop in the coming decade by about 50 to 100 percent. It is also expected that cattle products, particularly the hides, would find greater utilization by the development of tanning industry and the manufacture of leather goods on modern lines.

The forest resources of the Chhattisgarh Plain, particularly of its upland rim, promise the development of lumbering and furniture-making, shellac

and *tusser* silk manufacturing industries. Similarly, the bamboos and *bagai* grass are expected to encourage paper and pulp industry.

Further developments may also take place in the mineral-based industries. In particular, the vast limestone deposits would attract the cement industry as very recently located at Mandhar railway station near Raipur. The refractory industry can be developed since fire-clay is found in this region. Similarly, the general type of clay found here can give rise to modern pottery industry. The bauxite deposits near Korba and nearby places attract the development of an aluminium plant. It may specially be mentioned that with the intensification of the coal mining industry at Korba the low temperature carbonisation of coal and the manufacturing of calcium carbide can be developed. Lastly, the region also possesses potentialities for the manufacture of glass and explosives.

Industrialization and its Impact on Urbanization and Agricultural Development : The establishment of the Bhilai Steel Plant has resulted in the rise of Bhilai Nagar and Rajhara towns and the Nandini township.¹⁰ The neighbouring towns of Durg and Raipur have also definitely expanded with the industrial and commercial impact of the Bhilai Steel Plant. The railway stations close to existing cities have particularly attracted new industries like cement at Mandhar and chemicals at Kumbhari near Raipur and may become nuclei for urban growth. Korba has grown as an urban centre due to coal mining and thermal power generation plant located there.

Agriculture has benefited from industrialization in this region insofar as chemical fertilizers have become locally available in large quantities. Though agro-industries are limited mainly to rice milling, there has been some acceleration in the production of oilseeds leading to the growth of oil milling and lubricants.

Transport Pattern

The traditional routes of transport in the Chhattisgarh region were its roads used by bullock-carts and pack bullocks. The British rule brought a major change in the system of transport by the introduction of the railways which consist of

(i) the Nagpur-Calcutta route, (ii) the Bilaspur-Katni branch, (iii) the Raipur-Rajim branch, (iv) the Raipur-Wairath line, (v) the Raipur-Dhamtari and the (vi) Champa-Korba branches. Lines are broad gauge except the Dhamtari and Rajim branches. The Rajhara branch is a recent introduction to carry iron ore to Bhilai. Similarly, the Korba branch is meant to carry coal required at Bhilai (Fig. 20.10). Meanwhile the second quarter of the 20th century is no table for the advent of motor transport, which is now a days the most popular short-distance means of transport.

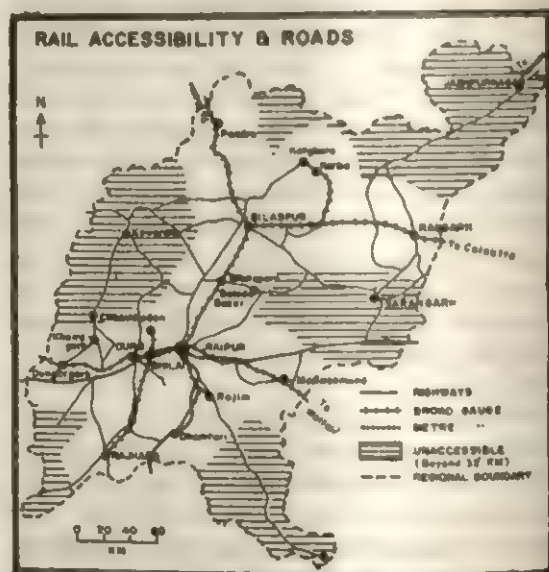


Fig. 20.10

The principal National Highway passing through Chhattisgarh Plain is the old great Eastern Road between Bombay and Calcutta via Nagpur and Raipur. From this branches another National Highway connecting Raipur to Vishakhapatnam via Dhamtari and Jagdalpur (Bastar District). Other important roads are Raipur-Bilaspur, Raipur-Kawardha, Raipur-Deobhog, Bilaspur-Sarangarh, Bhatapara-Sarangarh, Dharamjaigarh-Sarangarh and Kawardha-Khairagarh etc. This road system mainly links the interior areas to the rail centres of the region as well as to the great arterial, the Great Eastern Road.

Except for the Bombay-Calcutta route the railways in this region suffer from slow passenger transport. On the other hand, the bus services, mostly nationalized, have been increased in frequency, speed and capacity so that they are good competitors with the railways over short distances, say upto 6 hours of journey. Truck transport has become highly organised by private owners and handles both short and long distance goods traffic, especially foodgrains, building materials, forest produce and consumer goods. Air transport is presently confined to chartered services originating outside the region and terminating at the airstrips near Raipur and Bhilai Nagar. Raipur may be put on the air map by having regular flights between Bhopal and Raipur. At present the nearest airport is Nagpur in Maharashtra.

Accessibility : The greater part of the Chhattisgarh Plain is within 32 km from the nearest railway, but the upland rim lies beyond this limit and shows its poor accessibility. Roads are the only means of access to the uplands, except where they are crossed by the railway trunk routes.

Of the 4,408 km of all roads in the Chhattisgarh Plain districts only 1,780 km are metalled. This indicates that over half of the road system in this region provides accessibility to the concerned areas only during the fair weather, for in the rainy season, the muddy unmetalled roads become impassable by vehicular traffic. An idea of accessibility in this region can be had from the following table.¹¹

District	Road (km) per 250 km ²		Railways per 250 km ²
	Surfaced	Unsurfaced	
Raipur	5.42	3.52	1.88
Bilaspur	2.61	4.13	1.77
Durg	5.11	5.24	1.56
Raigarh	5.63	5.67	1.40

Among the means of communication, post and telegraph are the most important. Telephone services are rather expensive and therefore, they are largely confined to the industrial, commercial and administrative establishments in the urban centres. Raipur is notable for having four daily

newspapers—Nav Bhatat, Nai Dunia, Yugdharm and Mahakoshal, with wide circulation in the region.

The Regions

Chhattisgarh region can be divided into a hierarchy of regions chiefly on the basis of surface relief, drainage system and terrain characteristics. The functional characteristics of settlements and agro-economic landscapes as cultural features have also helped in demarcating and designating the regions (Fig. 20.11). As such the Region is divided into 2 first order, 6 second order and 15 third order regions :

42. Rimland

- (a) Northern Rimland
 - (i) Raigarh Plateau
 - (ii) Chhauri Hills
 - (iii) Fendra-Lormi Plateau.
- (b) Western Rimland :
 - (i) Maikal Range
 - (ii) Durg Upland
- (c) Southern Rimland :
 - (i) Rajhara Hills
 - (ii) Raipur Upland.

43. Chhattisgarh Plains

- (d) Raipur-Durg Plain :
 - (i) Trans-Seonath Plain
 - (ii) Mahanadi-Seonath Doab.
 - (iii) Trans-Mahanadi Tract
- (e) Bilaspur plain
 - (i) Bilaspur-Plain West
 - (ii) Bilaspur Plain East
- (f) Raigarh Plain
 - (i) Hasdo-Mand Tract
 - (ii) Trans-Mand Plain
 - (iii) Trans-Mahanadi Tract

The first order regions are based on major relief features and roughly correspond to the geological structure. The second order regions are based on secondary relief and drainage lines supplemented by cultural features such as the district boundary between the Durg-Raipur and Bilaspur Plains. This boundary, however, separates the north-easterly drainage from the southerly drainage and follows more or less the Tesua, an effluent of Seonath. The third order regions are clearly recog-

economy has, however, registered some changes since Independence through development programmes.

The Northern Rimland extends south from the Baghelkhand Uplands to the Mahanadi river basin. The Hasdo and Mand rivers which drain it southwards, divide it into three distinct parts, the *Rajgarh Plateau*, the *Chhuri Hills* and the *Pendra-Lormi Plateau* from east to west. This region is largely formed of ancient granites and gneisses with their characteristic rounded rolling topography. The soils here generally vary between red and dark brown according to the degree of land slope. Accordingly, the landuse also varies at short distances. The Korba coal deposits in the Gondwana rocks are notable for supply of coal to the Bhilai Steel Plant and for the generation of thermal electricity supplied to a greater part of the region. The bauxite deposits near Korba are also important for an aluminium plant being established there.

The Western Rimland includes the *Maikal range* on the western boundary of Durg district and the uplands on its south. This range is largely forested and presents nearly formidable barrier to the means of transportation. The *Durg Uplands* are rounded and rolling granitic and gneissic areas. They have soils ranging between red and black according to land slope. The landuse also varies accordingly.

The Southern Rimland consists of the *Rajbara Hills* in southern Durg district and the *Raipur Uplands*

in south-eastern Raipur district. The *Rajbara Hills* contain Dharwarian rocks in which iron ore is mined for the Bhilai Steel Plant. These mines are situated at Rajbara where a railway line goes from Bhilai junction for this purpose. The *Raipur Uplands* are granitic and gneissic surface. They are largely under forest. The Mahanadi has its source in the Sidhwa Range situated in these uplands. The Mahanadi Canal headworks are also located here. The varied relief gives rise to mixed red and black soils and the landuse corresponds to the soil types. Agriculture is generally limited to the more fertile lowland patches.

Problems And Prospects

The Region suffers from several problems mainly due of underdevelopment of both natural and human resources; not only secondary and tertiary sectors are developed but even agriculture is backward. Agricultural development on modern lines would have a snowball effect on general development of the area and a wider industrial base. Oil, textile, and sugar industries are likely to grow. The forests in the peripheral hills and plateaus need better conservation practices to give a sustained supply of raw materials for various industries. Several minerals outlined above would lead to the growth of cement, chemical and other industries. General development in the economy would encourage the development of transport also.

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Orissa Highlands ($17^{\circ}15'-22^{\circ}34'$ N and $82^{\circ}27'-86^{\circ}25'$ E) stretch NE-SW along the Orissa coastal plain for about 382 km and cover an area of about 76,800 km². It is bounded in the north by Chotanagpur, in the west by the Chhattisgarh Region, in the south-west by Dandakaranya Region, while to the east and the north-east lie the Orissa coastal plain and West Bengal respectively. The region comprises seven districts which have been partly carved out by merging together the various-sized princely States in the post-Independence period.¹ The ex-States of Bamra and Rairakhol joined with Sambalpur district. The Angul sub-division of Cuttack district and the feudatory states of Dhenkanal, Talchir, Pallahara, Athmallik and Hindol were merged to constitute the district of Dhenkanal. The ex-state of Baudh together with the Khondmals and the Baliguda agency areas of Ganjam district, form the district of Baudh-Khondmals. The two ex-states of Keonjhar and Mayurbhanj formed a separate district each. The Sonapur and Patna were merged to form Bolangir while the Gangpur and Bonai together constitute the present Sundargarh district. Thus, seven districts of this region were formed mostly through the merger of the princely states (Fig. 21.1).

Historical Background

The aboriginal races, mainly the Bhuiyas and the Gonds were the main inhabitants of this forest-clad undeveloped region of the country. In the 5th and 6th century A.D., some of the states were formed by the kings and princes mainly uprooted from Rajasthan and other parts of the country who wanted shelter, for the preservation of their freedom and honour. Mayurbhanj, Baudh and a few other states of Orissa came into

existence at the same time, but most of the others originated later (c.A.D. 900-1000), with the efforts of some Rajputs and the Marathas. It is noteworthy that numerous states of this region were very small in extent. The protective *Garh* (forts) were commonly constructed with the locally found stones. The dominant ruling agencies had been maintaining their supremacy even from long distances such as Jaipur etc. The rugged topography and lack of means of transport and communication protected them from outward invasions, both political and cultural. These states accepted the paramountcy of the British rule in India in the first decade of the 19th century and acceded to some control.

It will not be out of place to mention historical features of some States of the region.¹ Bonai's ruling Family is of Bhuiya origin which accepted the British authority some time in the first decade of the nineteenth century. The Athmallik state has got a very obscure history of its origin. It is supposed that the founder of the present family came from Puri and uprooted the king of the state and remained as the tributary state of Baudh. Bamra's ruling family was Gangbasi Rajput who belonged to the royal family of Patna. Dhenkanal state is said to have derived its name from an aborigine, Dh-nka. Gangpur state remained a part of Nagpur state under the rule of Marathas and was transferred from Chotanagpur to Orissa in 1905. Mayurbhanj state was founded about fourteen hundred years ago by a relative of Raja of Jaipur in Rajasthan. This state flourished with a considerable prosperity in the past and some of the remains of ruined structures near Udaipur prove the royal connection of Rajput rulers of the two distant states i.e. Rajasthan and Orissa. A cluster of states known as *Athara Garhajat*



Fig. 21.1

(Eighteen forts) and a large extent of territories to the east of the Ratanpur kingdom, remained under the control of the Maharaja of Patna State. It were mostly the Rajputs of different clans who settled and established their states within the region. Chauhan Rajputs claim to be the founders of the *Athara Garhajat* State. Rairakhol state was formerly subordinate to Bamra state but was freed in 18th century. Baudh state is one of the oldest in Orissa founded by a Brahmin

and later on organised and strengthened by a nephew of the Raja of Keonjhar who is regarded as the founder of the present family. Hindol consists of three or four petty states which have been reorganised by a ruling family of Madras known as Kimedi Raja.

The Physical Setting

The general geological sequences responsible for the present topography of the area are from

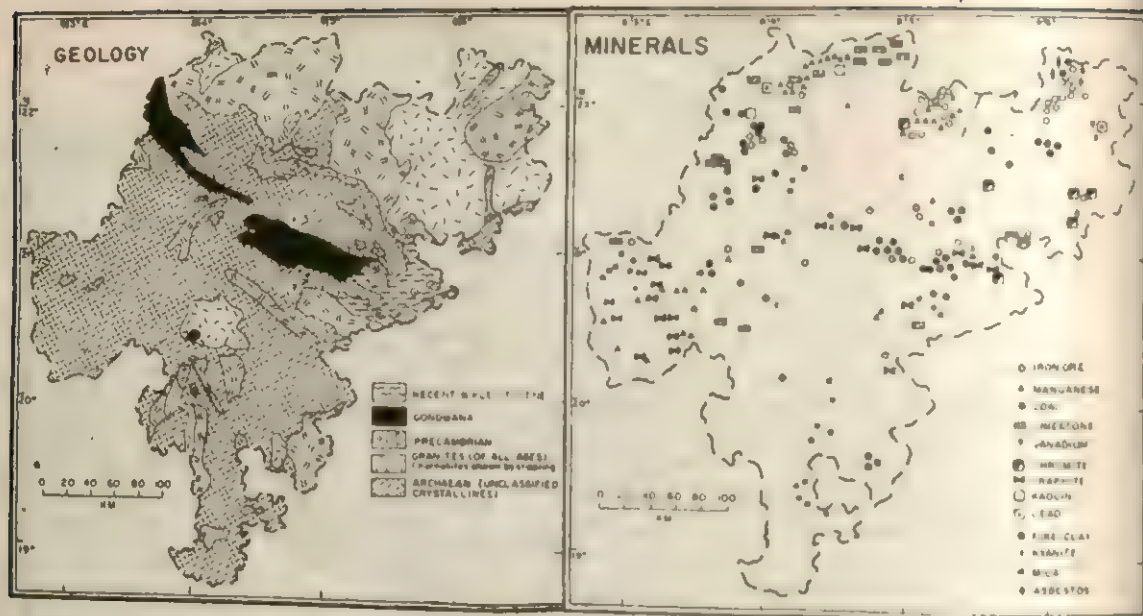


Fig. 21.2

the Archaean era to the Pleistocene age.² The unclassified crystallines which include granite, gneisses and other magmatic rocks with uncertain stratigraphical position are found in Sambalpur, Bolangir, Baudh-Khondmals, Dhenkanal and Ganjam districts of the region. The formation of pre-Cambrian group occurs to the south of the Brahmani river constituting the Eastern Ghats and the adjoining area and also to the north of the same river in the Bonai, Keonjhar and Simlipal areas. Rocks of the Gondwana System consisting of shales, sandstones and grits were deposited in faulted basins and troughs under riverine or lacustrine environments mostly occurring in Dhenkanal and Sambalpur in a narrow and elongated form. The Lower Gondwana coal fields have been divided into Talchir, Barakar, Kamathi (Himgir) series. The Talchir series consists of glacial boulder beds, and olive green shales indicating the existence of cold climate in that period. The Barakar and Damuda formations are coal-bearing. A group of limestones, sandstones and clays occurring in the bed of northern hilly regions belongs to the Miocene age. Larger deposits of laterite (and also bauxite) occur as capping over Khondalite hills. Such laterite is of the

Pleistocene origin found in the easternmost part of the Dhenkanal district (Fig. 21.2).

Orissa highlands present a complicated and interesting physical set up as the region contains several ranges rising above the coastal plains. It is mainly drained by the Mahanadi, the Brahmani and the Baitarani river systems which cut wide

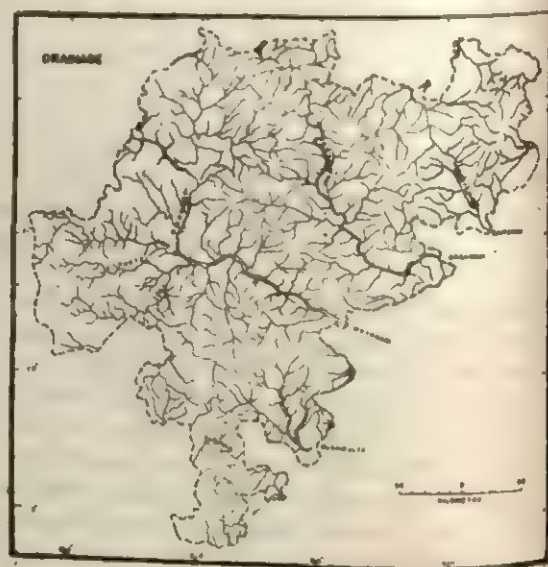


Fig. 21.3

valleys across the highlands (Fig 21.3). The Region is an interesting complex of denuded hills, plateaus, sharp ridges and mature valleys. The Mahanadi flowing west to east cuts it into two parts. The northern part is an extension of the Chotanagpur plateau and the southern part of the Eastern Ghats. Physically the region may be broadly divided into three distinct units, each with a different physical character: (i) northern uplands, (ii) the erosional plains of Mahanadi valley and (iii) Southwestern hilly region of Eastern Ghats.

Northern uplands covering Mayurbhanj, Keonjhar and Sundargarh districts and Pallahara subdivision of Dhenkanal district are undulating, frequently intersected by hill ranges, with a general slope from north to south. The Brahmani and the Baitarani dissect it into three blocks. The eastern block consists of the heavily forested hills of Mayurbhanj district. The middle block is again a well-forested hilly region which occupies most of Keonjhar district and parts of Dhenkanal and Sundargarh. The Western block is flat-topped and steep-edged with dense forest cover. The notable hill ranges are the Malayagir (1,169 m) in Pallahara, the Manakarnacha (1,099 m) in Keonjhar and the Meghasani (1,157 m) in Mayurbhanj. The average elevation in the central section of the upland is 900 m forming the most important watershed of the Baitarani and Brahmani.

The Erosional Plains of the Mahanadi river basin lie between the northern uplands and southwestern hilly region of the Eastern Ghats. This tract covers two-thirds of the area of Sambalpur and Bolangir districts and one-third of Dhenkanal. Isolated hills rising abruptly from the plains are a frequent sight. The middle part of the Mahanadi valley and the lower Tel basin are quite extensive. The valley tract is demarcated by 150 m contour.

South Western hilly region constitutes the last lap of the great line of Eastern Ghats of India lying to the south and southwest of the Mahanadi valley region, stretching through Khondmal and Ganjam districts. There are some scattered hills and high plateaus in Bolangir district also. This region comprises wide-open plateaus fringed by forests and hills which have the highest peaks in the State. Outstanding among them are Mahen-

dragir (1,490 m, Ganjam district), Champajharan (1,250 m, Khondmal district) and Harishakar (970 m, Bolangir district). Most part of this region has an elevation of over 900 m acting as the watershed of the two sets of rivers, one set flowing directly to the Bay of Bengal, namely the Rushikulya, the Nagawati and Vamsadhara; and the other feeding the Godawari and Mahanadi systems (Fig. 21.4). The hill slopes have thick and valuable forest cover.

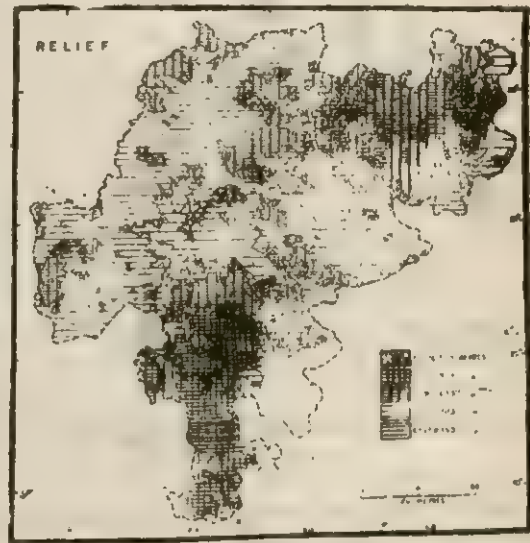


Fig. 21.4

Climate

The tropical monsoon climate of the region is characterised by high temperature in most parts of the year and medium to high annual rainfall. The minimum annual temperature is 18.5°C, rising to 24°C in April and May and falling to 20°C in July and about 13.5°C in January.³ The mean annual rainfall is 150 cm, varying from 130 cm to 165 cm. (Fig. 2.5). Sundargarh, Mayurbhanj and Keonjhar districts lying in the north receive the maximum rainfall in the area while Ganjam records the lowest. Here, monsoon currents of the Bay of Bengal and the Arabian sea converge, though most of the area receives rainfall from the Bay of Bengal branch of the southwest monsoon. Some cyclonic storms, during the period of the southwest monsoon, move towards the area in north-westerly direction. A few squalls of

colleagues and caused to examinations of the embryological type. They are found from the southern extremity of the region to the north end of the island, passing through the central zone and thence to the northern zone. They are found in the central zone to the north end of the island and thence to the north end of the island and thence to the north end of the island.

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End

There are two types of eggs in the region. Fig. 21 shows the collection of eggs in the region. The eggs are found in the central zone to the north end of the island and thence to the north end of the island and thence to the north end of the island.

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Fig. 21

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in Baudh subdivision. It is also found in Sonepur subdivision of Bolangir but in a very limited area. The soil is rich in potassium and magnesium but poor in nitrogen and phosphorous. It is suitable for growing rabi crops like pulses and wheat.

Minerals

The mineral resources of Orissa Highlands are rich and extensive, the important ones being iron ore, coal, manganese, chromite, dolomite, fireclay, chinaclay, graphite, kyanite, kaolin, vanadium, bauxite, copper, lead, asbestos and mica. Most of these minerals occur mainly in the four inland districts of Mayurbhanj, Keonjhar, Sundargarh and Sambalpur⁴ (Fig. 21.2). Iron ore is of much superior quality, Chromite is more abundant; coal and manganese are of low grades. Among the various States, Orissa ranks fourth after Bihar, West Bengal and Madhya Pradesh in mineral production.⁵ The State enjoys a significant place in the production of manganese ore (31%), Chromite (60%) and dolomite (45%) in the country (1965).

Orissa has very adequate reserves of iron ore. The main iron ore concentrations are in Keonjhar district, Bonai Sub-division of Sundargarh district, Mayurbhanj and Sambalpur districts. The region has about 1/3rd of the country's proved reserves of high grade (55% to 69%) exploitable ore. Keonjhar district with about 1000 million tons of proved reserves is the most important iron ore mining area of the State. Next comes Bonai sub-division of Sundargarh district. Between 1950-57 iron ore output in the State increased from 1.528 mill. tons to 2.054 mill. tons i. e. by 34.5%. By 1965 the production reached to 6.65 mill. tons.

The estimated proved reserves of coal are about 800 mill. tons but the known are 140 mill. tons at Hinger-Rampur (Sambalpur) and 150 million tons at Talcher (Dhenkanal). The present annual production is 1.2 mill. tons (1966).

The reserves of manganese are estimated at 20 mill. tons, most of which exist in Keonjhar (15 mill. tons), Sundargarh (5 mill. tons) and Bolangir district. The total production used to be exported previously but the present policy is to manufac-

ture ferro-manganese for export rather than to export manganese ore in crude form. The present production meets the requirements of the ferro-manganese plants at Joda (Keonjhar) and of the steel plants at Jamshedpur and Rourkela.

Chromite occurs mainly in Keonjhar and Dhenkanal with estimated reserves at 420,000 tons and total production (1965) 56,804 tons. Limestone and dolomite are found in Sundargarh and Sambalpur with estimated reserves of 130 and 250 mill. tons respectively. In 1965 the region produced 2.5 mill tons of both the minerals. They are consumed mainly by the iron and steel industry. Sundargarh and Sambalpur annually produce 77,727 tons of fireclay. China clay is equally important and occurs mainly in Keonjhar, Mayurbhanj, Sambalpur and Sundargarh districts. Production of China clay has shown considerable fluctuation as the region produced 39,752 tons in 1960, 28,705 in 1961, 49,032 in 1964 and 12,700 tons in 1965.

The Region is credited with other minerals such as asbestos (Mayurbhanj, Sundargarh), bauxite (Bolangir, Sambalpur), copper (Mayurbhanj and Bolangir), lead and zinc (Mayurbhanj), graphite (Bolangir, Sambalpur, Dhenkanal), Kyanite (Dhenkanal, Bonai, Sundargarh, Mayurbhanj) and nickel (Dhenkanal, Keonjhar).

The Cultural Setting

Population

The region is one of the less densely populated parts of India as it has only 7 million persons over 76,800 km², carrying an average density of 90 persons per km² (Fig. 21.8). There are naturally wide variations in a region which has very contrasting land features within short distances. The northwestern fringe, particularly Sundargarh and Sambalpur districts, are thickly populated where most of the towns of the region are also concentrated. The concentration of rural population is also marked in the northwestern portion of the region from Bolangir to Rourkela. The Hirakud dam with its extensive canal system, has contributed to the agricultural prosperity in a portion of this belt.

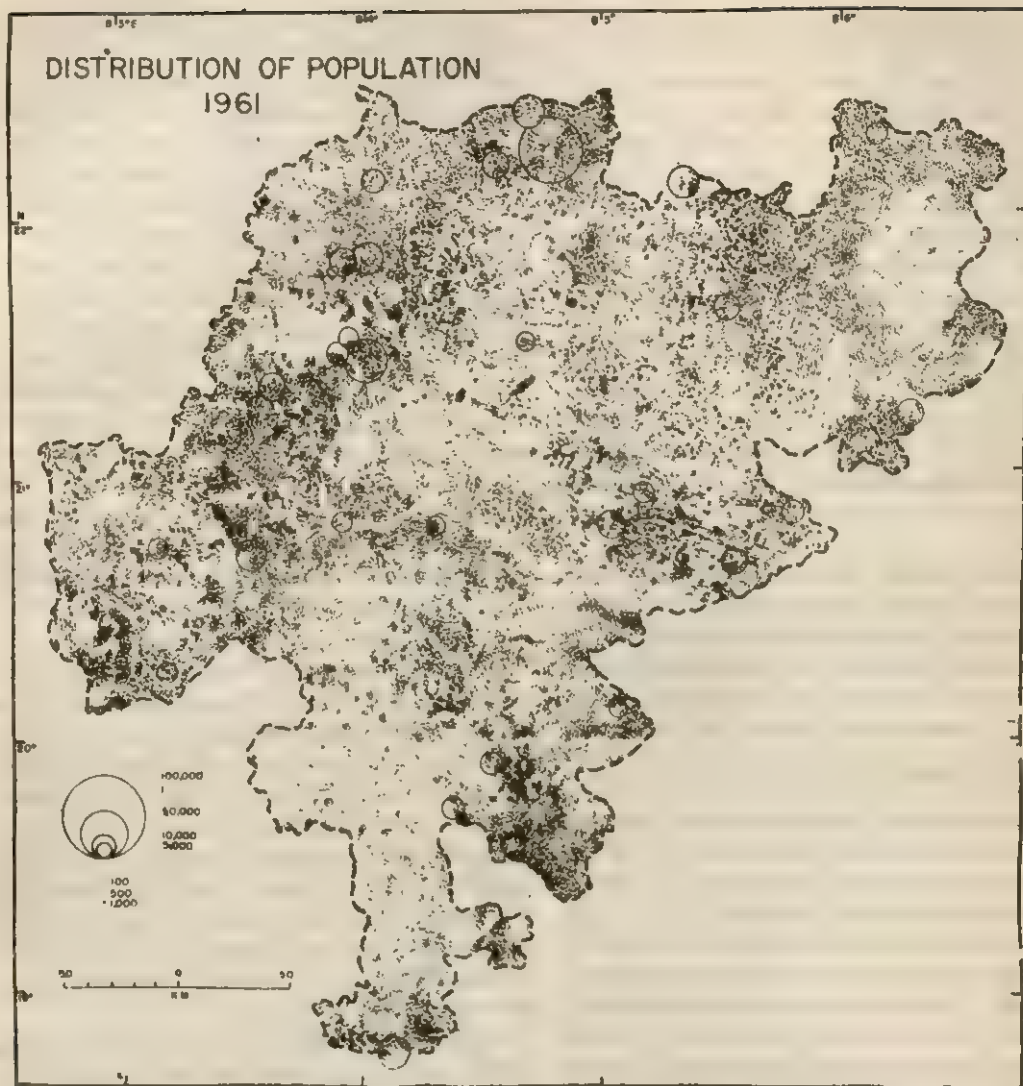


Fig. 21.8

The sparsely populated areas form the central belt of the State, extending from south of Baudh-Khondmals to central portion of Keonjhar and Mayurbhanj passing through the table-lands of Ganjam, Baudh-Khondmals and portions of Dhenkanal, Sambalpur and Sundargarh. In this belt agriculture is comparatively less prosperous on account of poor soil conditions and industries are also less developed due mainly to lack of transport facilities.

The average density of population (90) is less than the State average (113). The disparity in density in different localities is striking (Fig. 21.8). The density of population roughly corresponds to the fertility of agricultural lands and facilities for irrigation as in the Hirakud Project area. Another important factor is the industrial development now taking place in many localities of northern districts. The rural areas surrounding the industrial towns have thick population,

sometimes 500 persons per km² in small pockets. The density is low in the south-west and eastern parts of the region, particularly the region through which run the Eastern Ghats; for instance Baudh-Khondmals (46) has the lowest density.

The population of the highlands during the last sixty years (1901-61) has recorded an increase of 107.35 percent. All the districts have gained in their population, though with varying rates. The lowest growth has been exhibited by Baudh-Khondmals (54%) and the highest by the district of Sundargarh (173.3), mostly due to the recent industrial development. Next to Sundargarh heavy gains were made by Keonjhar (167%) and Bolangir (139%). The increase in the districts of Mayurbhanj, Sambalpur, Dhenkanal, Ganjam and Baudh-Khondmals was below the regional average.

The State average for sex-ratio is 1,001, which varies from 1,256 in Gangpur P.S. of Ganjam district to only 537 in the industrial tract of Roufela P. S. in Sundargarh. There is low ratio of females in Hirakud P. S. also. Thus the industrially developed tracts have lower ratio.

Rural Settlement

Physiography is a significant factor affecting the nature of rural settlements in the Region. In the northern undulating upland and hill ranges, mostly in Mayurbhanj, Keonjhar and Sundargarh district, settlements are found in the valleys and along valley slopes, while there are few on the spurs and hill tops. Every compact settlement has got the traditional villaged oritory as is the characteristic of the tribal population here, locally called, *Mandaghar*. Around this *Mandaghar* the village settlement forms a compact ring. The Juangs are one of the primitive tribes confined to the hilly country of this region. Hill Bhuiyas and Goals (Milkman) occupy a large portion of the area. The river basin contains some of the fertile parts of the State, mostly in Bolangir, Sambalpur and Dhenkanal districts. The Mahanadi—Tel basin in the northwestern part of the region is the most populous and agriculturally prosperous tract of the area credited with compact settlement almost everywhere. The isolated hills rising abruptly

from the plains have mostly scattered and semi-compact rural settlements.

In the south and southwestern part of the central river basin, the eastern hills are also characterised by uneven settlement pattern with small semi-compact and scattered settlements. Here also the villages depict the primitive culture of their inhabitants. Huts are very small and generally rectangular in shape. Sometimes two or three huts are constructed in a row. Walls are made of wooden logs plastered with mud. The pitched roof is the general pattern. But in Mandaghar or in big huts the gable is not uncommon. The roof is thatched by different types of grasses, some of which are cultivated for the purpose.

Raidiha and Hatsila^a : These villages are situated within the central zone of the Keonjhar hills representing different type of ecological setting whose impact is reflected in their different economic status and land use patterns.

Raidiha is divided into two settlements, one is about 7 km away from the border of the other. Here, East Raidiha has been selected for study (Fig. 21.9). There is no economic relation between the two villages and each is independent of the other. Boundary lines between villages generally follow hills or streams. The village areas of Raidiha East and Hatsila are about 4 and 3.8 km² respectively. As the area is comparatively hilly; the figures have been corrected by taking the average slope which is 20° for both the villages.

The total population of Raidiha and Hatsila is 127 and 72 respectively, which reflects the generally low-supporting capacity of the land. Some families of milkmen or *Garra* also use the village land for pasturing their cows and buffaloes. They depend on rented land for settlement and also for producing small quantities of maize and mustard.

Paddy, pulses, millets and maize are grown for subsistence; mustard and oilseeds are cash-crops. Agriculture and cropping are not uniform among all the communities in these villages. Juangs, for example have only a rough idea of the use of land for growing crop. Shifting cultivation is

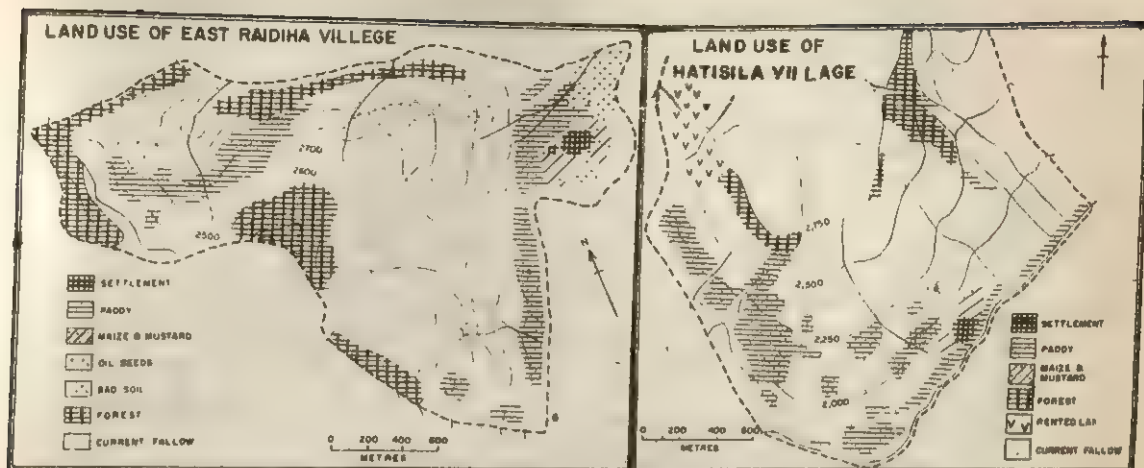


Fig. 21.9

practised mainly on the hill slopes as these areas have only thin soil cover while the valley portions, if found suitable, are restricted to permanent paddy fields. Cultivable tract within current fallow is about 50% in each, but the cultivable percentage within net total area is 46 in Raidiha and 53 in Hatsila (Fig. 21.9).

The landuse of Raidiha (Fig. 21.9) depicts 118 acres under *Taila* paddy and 96 acres under *Belaw* paddy. 9 Acres of land are under settlement. Current fallow has got the highest acreage of 634 acres followed by permanent forests, covering more than 137 acres of the area of the village. Likewise the landuse pattern of Hatsila shows 108 acres under *Taila* paddy and 38 acres under *Belaw* paddy. Current fallow occupies more than 77% of the total area (771 acres). Settlement is found on a small area of 5 acres, in the southeastern margin of the village.

Urban Settlements

Urban settlements are not developed in the region except in a few recently developed industrial areas. There are 28 towns in all, which are irregularly distributed. Rourkela steel plant in Sundargarh and Hirakud project in Sambalpur district associated with mining and developing industries have increased the urban population to 19.89% and 7.64% respectively in the above two districts. In the northwestern part of the region,

urban centres like Bolangir, Sambalpur and Rourkela have emerged. The central, southern and eastern parts of the region lack urbanization. The urban population of Baudh-Khondmals is only 1.18% even today. Dhenkanal and Keonjhar record about 4.57 and 4.37 of their population as urban while Mayurbhanj has only 2.73%. Most of the existing urban centres are service and administrative towns and out of 28 towns in the region (1961) as many as sixteen have various services as their predominant functions. Sonepur, Baudh, Bellangguntha (Ganjam), Bargarn and Jharsuguda combine industry with commerce and services. In Kantabanji and Jharsuguda towns, transport assumes importance. It may be remarked that the region is moving ahead with somewhat accelerated urban trends with the increase in the number of industries, means of communication and transport and other urban activities.

Rourkela (1961 Pop. 90,287) is the largest city of the region. Its study not only presents the morphology of the steel city but also reflects on the future urban growth and patterns in the region. Rourkela⁷, an obscure village originally consisted of a cluster of hamlets inhabited by *Adivasis*. In all, there were 32 villages scattered over the area occupied by the city now (Fig. 21.10). Situated within the fork of the Brahmani and the Koel rivers the whole landscape in general was

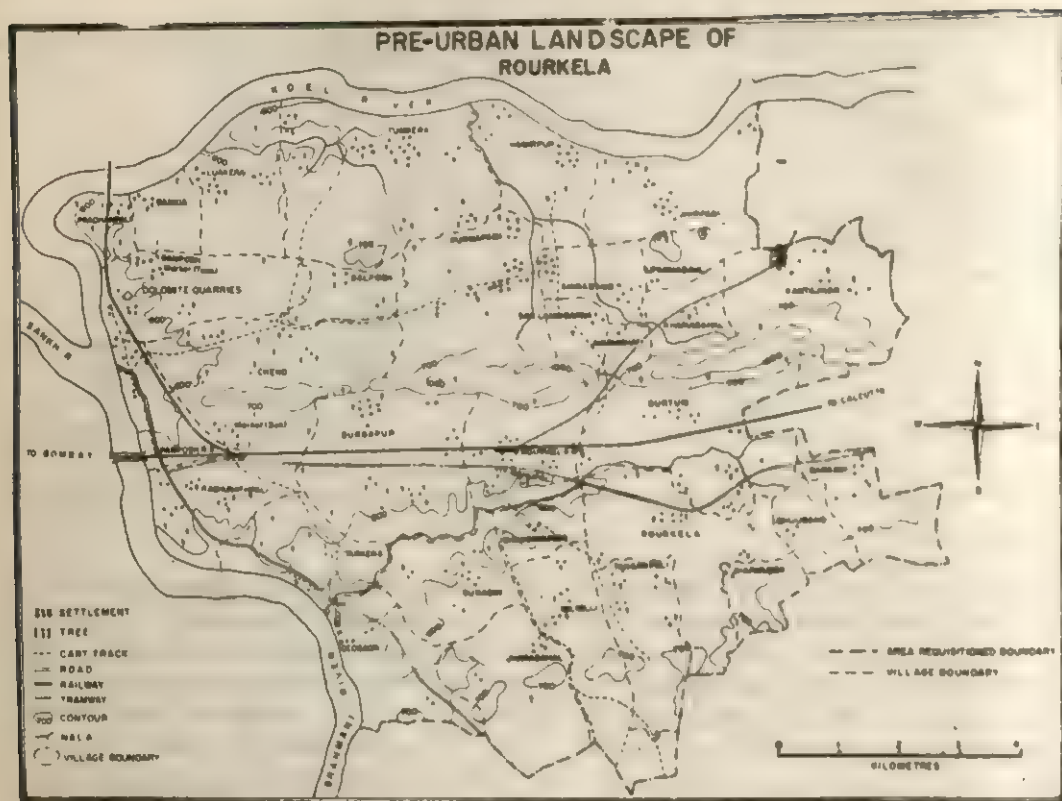


Fig. 21.10

nothing more than rural and forest-clad area. In 1955 the construction of Rourkela steel plant was started and general layout plan which could be fitted and adopted for the known future population of an emerging township was prepared with collaboration of a few German experts. It is based on the popular concept of self-contained residential units.

In the north of the central ridge, this beautiful steel town elongated in east-west direction has been divided into 20 residential units, called neighbourhood sectors. All these residential sectors are located on both sides of ring road which also connects the Steel plant and forms the main backbone of the Rourkela township (Fig. 21.11). Further, three public sectors, in the middle of the eastern part of the town, and aerodrome in the extreme west, have expanded the township in the same elongated fashion. From 1955 onward the expansion programme of the growing town has continued and till now about 15,377 houses have been constructed.

Now this steel township girdled by green and beautiful hills and encircled by three perennial rivers i.e., the south Koel, the Sankh and the Brahmani can claim to be one of the prettiest townships in India. The hills in-between have been used as a screen between the plant and the township. The shape of the steel township is of an elongated parallelogram.

In addition to the east-west extensive growth of steel township, the H.S.L. plant occupies a large extensive area for its industry in the south of Central hill range. The Second and Third Five Year Plans have considerably added to the built up area by extension of the steel plant, erection of fertilizer plant, associated labour colonies and fertilizer township. Rourkela Steel Plant built south of the Central Hill Range at a distance of 3 km, for the steel township occupies about 4.5 km² of land, yet there are sufficient open spaces available for future development. It is notable that in 1955, the total population of this rural

area was about 8,000 but due to the establishment of the steel plant the population increased to 90,287 in the short span of six years only. It is expected that by now the population must have reached 125,000 persons. This accelerated rise of population is mainly because of immigration from outside.

The landuse pattern of Rourkela reveals that 28.2% of the total built up area is under industrial use. Residential areas are naturally dominant occupying 61.6%. The business and recreational areas occupy 2.0 and 0.9% of the total built up area respectively.

General Land Use

The pattern of utilization of land in districts of Orissa highlands varies widely.

TABLE 1

Land use Percentage (1961)

District	Forest	Pasture	Cultivated Land	Waste Land
Bolangir	43	20	25	12
Sambalpur	30	20	35	15
Sundargarh	40	25	24	11
Keonjhar	30	27	28	15
Mayurbhanj	34	23	40	3
Dhenkanal	52	20	18	10
Baudh Khondmals and Gaya Hills	62	15	18	5
Puri & Cuttack Highlands	27	17	41	21

It is obvious that cultivated area is less than

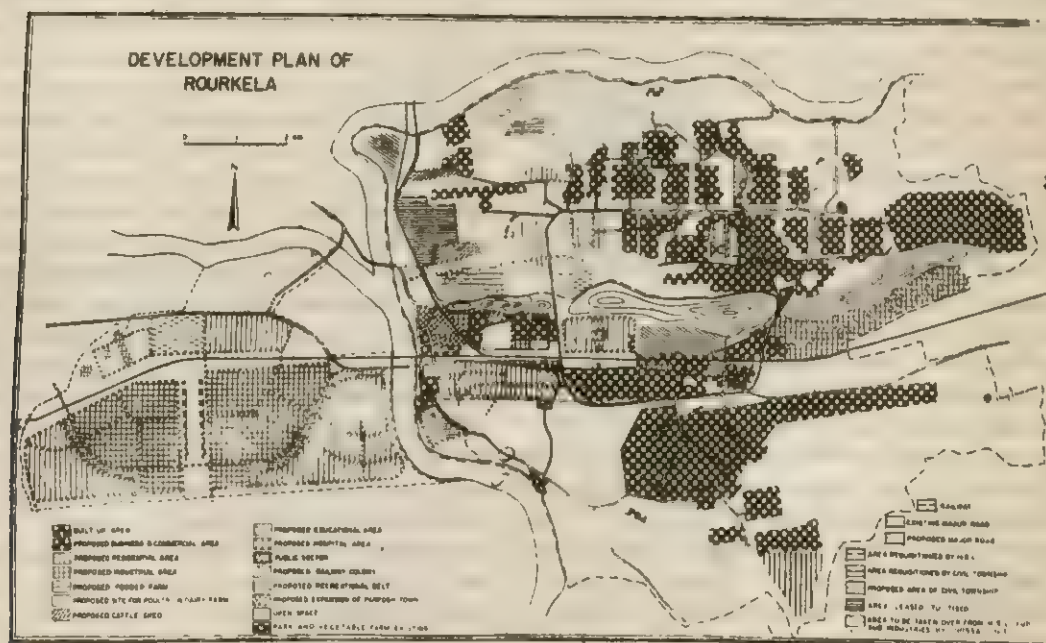


Fig. 21.11

one-fifth of the total area in Dhenkanal and Baudh-Khondmals, one-fourth in Bolangir and Keonjhar and one-third to two-fifth in others. Pasture and waste lands take sizeable portions of the region, while forests are dominant in most of the areas.

Agriculture : Among the crops, paddy is the most important. It is the staple cereal and is raised by the tribal people as cash crop also. The average yield (674 lbs per acre) is much below the national average. Quality of rice produced is very fine in the western part and coarse in the

eastern areas. It is most widely cultivated in the river valleys of Mahanadi, Brahmani, Baitarani and Buda Balang, Rushikulya and in the Hirakud canal area. Irrigation systems have recently ensured the crop against failure of rain in some areas. Bolangir, Sambalpur, Dhenkanal and eastern periphery of the region have intensive paddy areas. In Phulbani and Sundargarh, cultivation of paddy is insignificant. Normally it is broadcast, but in the irrigated areas of Hirakud basin it is transplanted. *Dalua* paddy is also raised in the irrigated areas. After introduction of package programmes, new technique of paddy cultivation has been introduced in Sambalpur area.

Wheat is also an important crop in the region but is cultivated in a limited area of 7,809 acres in the hilly part of Sambalpur, Bolangir, Sundargarh, and Baudh-Khondmals. Millets are cultivated in drier interior parts and claim 23,685 acres of land in Bolangir, Sundargarh and Dhenkanal districts. Gram, *mung*, *biri* (Black gram), *káltha* (*Doliches bilforus*), pea, mustard, linseed, groundnut, jute, mesta, cotton, and sugarcane are other crops. Oilseeds and pulses are raised in *taita* (virgin lands) or on foothills in Bolangir, Phulbani, Sundargarh, Keonjhar and Dhenkanal areas. Jute is cultivated only in low river valleys for domestic purposes. Sugarcane has now taken important place in irrigated areas of Ganjam, Bolangir and Sambalpur, where some sugar mills have been established. Nearly 30,353 acres of land are now under sugarcane.

Fruit cultivation like banana has taken important place in lowlying irrigated areas of Bolangir and Sambalpur. Orange, guava and other citrus fruits are raised around Angul. Mangoes of native variety are raised in all parts but more in the eastern parts. The intensity of cropping is maximum in Cuttack uplands and is low in Sundargarh areas.

After the implementation of last three Five Year Plans a good deal of change has crept into the pattern of land use. Irrigation, and application of chemical fertilizers and manures have become popular. More cultivable fallow lands were brought under plough. Double cropping has become a rule in favourable areas,

particularly in Hirakud canal zone. New cash crops like groundnuts, sugarcane and banana have taken important position in production, thereby increasing the standard of living of the farmers.

The average size of agricultural holdings in different districts of the region vary from less than 4 acres to above 7.5 acres as against the State average (5.31 acres). The size of holdings decreases from the western sparsely peopled areas to eastern densely peopled areas. Likewise, per capita agricultural holding also decreases in size from 1.12 acres in Bolangir to 1.08 acres in Sundargarh, 1.01 in Sambalpur, 0.78 in Keonjhar, 0.73 in Mayurbhanj, 0.70 in Baudh-Khondmals, 0.68 in Dhenkanal and 0.52 acre in Ganjam and Cuttack highlands. The State average of per capita holding is 0.76 acre. Thus the size of the per capita holding in the region bordering the west and the north is larger than in the eastern areas.

Animal keeping as secondary occupation to cultivation of crops is common in this area. Cattle, buffalo, goat and sheep are kept in every peasant home. In spite of large areas of pasture and open forests for grazing, animal health is much below the standard and yield of milk is extremely low. Pig and poultry are kept by tribal people. Nowhere the animals are reared on commercial scale. Rapid industrialisation and urbanisation and increase in earning have increased the demand for large and regular supplies of milk, eggs and mutton. To cope with this demand, the State Govt. have established large animal farms at Chiplima (near Sambalpur), Sundargarh (near Rourkela), Bhanjanagar, Angul and in other urban centres. Inland fishing in tanks and pools has been greatly encouraged in recent years. Hirakud reservoir supplies regularly thousands of maunds of fish annually to Rourkela, Bhilai and other adjacent industrial centres.

It can be remarked here that due to very low cropping intensity, the agricultural output per acre is very low. Except in Bolangir (2%) and Ganjam (11.5%), double-cropping is very insignificant.

Irrigation : In the economy of the Highlands of Orissa agriculture is the most predominant

sector but it is highly dependant on rainfall except in a few areas. However, due to adequate rainfall the region has a large irrigation potential. In 1953-56, the total irrigated area in the region was about 8.5% of the total cropped area. Of this, 23.1% was served by canals, 50.6% by tanks, 3.9% by wells and the rest from other sources. Nearly 42% of the total area irrigated of the State was in the Central table-land and Mahanadi valley region. Generally speaking, tanks were more important at that time than the canals and the wells. By 1959-60, about 1.5 million acres or 18.6% of the total net sown area (over 8 million acres) were irrigated; canals claimed 37.6% of the total as compared to 23% in 1955-56, and tanks, though widely fluctuating, irrigated 44.4%. The mortality of tanks in the State is high since there is no systematic effort to repair and restore them.

Wells have not shown any increasing tendency inspite of the fact that electrification in the State has gone high and power is being used for lifting up the ground water by tube-wells. However, it can be marked that there is wide gap between the potential and the utilization of irrigation.

Due to presence of a large number of schemes and projects it is expected that by the end of Fourth Five Year Plan the potentialities of irrigation will be developed to an appreciable measure. In addition to Hirakud system, which supplies water for 3.7 lakh acres in Sambalpur and Bolangir, Salaki weir project in Phulbani, Ghodahado dam project, Danai dam project, Joro and Hadabhangu project in Ganjam, Darjang project in Dhenkanal and Salandi project in Keonjhar are the important minor and medium projects. Further, efforts are being made to double the canal-irrigated area by various schemes and sources. Individual rich farmers have their own *cutta* or tanks or *bandh* (plugging the narrow valleys and collecting water for irrigation) for local irrigation purposes. Beside, wells with manual labour (*Tenda* or *Latha*) play significant role in watering kitchen gardens and farms. Minor and medium irrigation projects have proved more fruitful than the major projects in this area. Availability of cheap hydel

power has encouraged tapping of underground water in certain valleys of the region.

The percentage of net irrigated area to the net sown area varies between 5 to 25%. Keonjhar, Sundargarh and Phulbani districts record below 5%, while Mayurbhanj and Bolangir fall in between 10 to 15%. Other districts of the region namely Sambalpur, Dhenkanal and Ganjam record more than 25%.

Industry

Paradoxically, Orissa, a State rich in raw materials, marks a sorry figure on the industrial map of India. This area is extensively rich in various minerals, forest-products and power resources. Up to the late nineteenth and the early decade of twentieth century, the area remained predominantly agricultural with over 80% of the population dependent on agriculture. Very recently some large-scale industrial establishments have sprung up. The reasons for the industrial backwardness of the State may be summed up as follows:

(i) Until 1948, most of these areas were under princely states where enough means to set up industries were not available. (ii) This area did not have capital, labour, market and transport to gravitate industries., and (iii) adverse political conditions did not attract industrialisation whereas adjacent states drew only raw materials from here.

During the First and Second Plan periods, the efforts of the State government were confined to the development of small-scale industries and establishment of some industrial estates. In the Third Plan period, the State government itself established certain industries like cement, paper, ferro-alloys and cables. In regard to Central Government industrial schemes, the most important one is the integrated iron and steel plant at Rourkela, which went into production during the Second Plan and whose capacity was also expanded from 1.0 to 1.8 million tons during the Third Plan. The other important projects are the Nitrogenous Fertilizers Unit at Rourkela, the Aero-Engine Division of Hindustan Aeronautics Ltd., and Daitri Iron-ore Development for exports to Japan. In addition, the Talcher complex development may also become important.

Despite these efforts the overall industrial development at the end of Third Plan was not very great. The establishment of integrated iron and steel plant at Rourkela has not produced any spread effects. State governments' achievements in this direction also remained meagre.

Among the major locational factors of industries the contribution of power supply appears to be the first. Importance of coal as a motive force cannot be over-emphasized and extremely low coal reserves is one of the very fundamental causes of the present industrial backwardness of the region. Generation of electricity by different means viz., hydel, steam and diesel is prevalent. The installed capacity of all the power stations in Orissa (1963-64) was 320.5 MW being generated by 28 power stations of the State. Out of these, Hirakud Hydel system (Sambalpur) generates 270 MW (Burla, 198 MW and Chiplima 72 MW). There is one thermal station at Rajgangpur (Sundargarh) which produces 6,500 KWh of electric power. Besides, there are 12 small diesel stations located in different localities generating 2,448 KW of electricity. In generation of hydro-electricity, Sambalpur is the most important district followed by Sundargarh, Bolangir and Keonjhar.

The changing pattern of generation of electricity in the region has been rather quick. The share of steam plants in the total generation which was over 80% in 1955 was reduced to a mere 0.2% in 1959-60, while the generation from hydro-plant shot up from less than 0.1% to 98.4% mainly due to the commissioning of the Hirakud Hydro-electric Project. The Talcher Thermal Power Station (Dhenkanal) with a capacity of 250 MW will be the largest of its kind in India.

The mineral, agricultural and forest resources form a sound base of raw material for different types of industries.⁸ However, infrastructural development is required for their fruitful utilization. Labour has not yet become a problem since the State is on threshold of industrialisation and the field of agricultural employment is not only crowded but also unremunerative.

Textile industry is found in all the districts of the region. Cotton textile industry employs a

large number of workers (125,474). Sambalpur district alone has about 40% of these workers, followed by Bolangir (18), Ganjam and Mayurbhanj (14% each). However, the industry suffers from lack of good quality of cotton in adequate quantity. Jute industry employs 1,964 persons while silk has 587 persons. The region has little of wool industry as there are only two establishments in the district of Ganjam.

Of the food-processing industries, rice milling is by far the most important. Rice mills and sugar factories are found in all the districts but the principal ones are located in Ganjam and Mayurbhanj. The number of persons employed in sugar factory are 1,212 while the rice and *dal* mills employ 3,126 persons. Bakery and confectionary factories are found in all the districts, mainly in Ganjam. Fruit preservation industry has limited scope. Oil mills and *Bidi* works are found in all the districts with high concentration in Sambalpur.

Although Orissa has one of the richest mineral deposits in the country yet till recently it was not prominent for its mineral-based industries. Development of metallurgical industries is very recent in the region. The Rourkela Steel Plant started production in 1957. The ferro-manganese plant at Joda started production in 1958. There is one aluminium plant at Hirakud with capacity of 20,000 tons per year. In addition, a ferro-chrome plant with a capacity of 10,000 tons and a ferro-silicon plant with capacity of 500 tons have been installed in Hirakud area.

The integrated Iron and Steel Plant at Rourkela which commenced with an output of 1 million tons has been expanded to 1.8 million tons capacity. The expansion of this unit to 2.5 million tons was originally under consideration for the Fourth Plan.⁹ The location of Rourkela is based at the point of minimum transfer-cost backed by easy accessibility to raw materials. Even though the ton-mileage of coal is about three times as that of ores, the site is selected at the sources of ore only to have shuttle services between coal and iron heads. The Iron and Steel mills are already located at the sources of coking coal in Jharia coalfield area, which have to depend on ore supply from Bonai and Keonjhar.

The region has sufficient resources for a second steel plant. Like Rourkela it can receive coking coal from Jharia. Talcher coal reserves though not suitable for coking can be used for other purposes. Limestone, dolomite and water are sufficiently available locally. The most suitable site for a new steel plant would be at Bonaigarh. Power would be available from Hirakud or the thermal power station at Talcher.

Industries based on non-metallic minerals have a somewhat longer history. There are two refractory plants with a total annual capacity of 134,000 tons. There are one cement factory with an annual capacity of 363,000 tons and two plants manufacturing glass with a total capacity of 13,000 tons per year. Recently three new plants have been licensed with an annual capacity of 100,000 tons of refractories. Viewed against the available mineral resources and the anticipated all India demand there is considerable scope for further development of non-metal-based industries in Orissa. Limestone and clay, the two important raw materials for the production of cement are found in Sundargarh and Sambalpur where fireclay is also important. Slag would also be available for pozzolanic and slag cements. At present there are two cement plants working in the region : one is Orissa Cement Co. Ltd., at Rajgangpur (Sundargarh) making 378,000 tons of portland cement and 15,000 tons of pozzolanic cement. Here the number of workers is 880. The second plant at Bargarh (Sambalpur district) has an annual capacity of 396,000 tons of portland cement. These plants are getting fuel supplies from the coal mines of Damodar basin and from Rampur of Sambalpur district.

Talcher with its large amount of lignite has attracted establishment of a large coal-based fertilizer factory. At present, the only fertilizer production unit is at Rourkela. The plant is designed to produce 580,000 tons of calcium ammonium nitrate per annum. It was commissioned in October, 1962. However, on account of the inadequacy of coke-oven gas, the plant has been working at about 50% of its capacity. In terms of nitrogen, the capacity of the plant is 117,000 tons per year. One possible source of supply for ferti-

lizers can be through the utilization of ammonia from coke-ovens to be installed in the proposed iron industry complex at Talcher during the Fourth Five Year Plan.

Saw mills and furniture works are found at Rourkela, Sambalpur, Bolangir, Kontayange, Jharsuguda, Dhenkanal, Talcher, Joda, Banpada, Bhanjanagar and Phulbani. A large paper mill has also been established at Brajrajnagar (Sambalpur). The annual output of timber has been estimated at 0.64 million cubic metres. The annual current output of bamboo in the region is about 400,000 tons (potential 500,000 tons); of this about 300,000 tons are utilized for the production of paper. With abundance of Sabai grass and bamboo, cheap hydel power and plenty of water in the Mahanadi, Brahmani and Baitarani there ought to be more paper mills in the area.

The only livestock-based industry of any significance is tanning, because the livestock population in the region is considerably high.

There is one medium size tannery (capacity 200 hides and skins per day) located at Titlagarh (Bolangir) and one small unit (40 hides per day) at Baudh. Large number of hides and skins are exported because there is lack of adequate means of processing.

Industrial Regions : Industrial development in the region has been largely confined to the north of the Mahanadi. There are two important concentrations in Rourkela-Rajgangpur area and Hirakud-Brajrajnagar area. The Rourkela Rajgangpur complex is based on steel, cement and to some extent on textiles. Here the industries are mostly mineral-based, nearness to mineral resources being the main factor in their location. The composition of industries in Hirakud-Brajrajnagar area is quite different with paper industry dominating, supported by aluminium, engineering works and saw mills. Besides the engineering workshops which cater mainly to the needs of the Hirakud Hydro power station and the aluminium plant, other industries in the Hirakud Brajrajnagar region are forest-based.

South of the Mahanadi, small scattered groups of industries, largely on local resource-base have grown up. One concentration of small-scale

industries is in Titlagarh and the other group is concentrated in Aska (Ganjam). Rice mills, saw mills, sugar mills and engineering workshops account for nearly all the industries in this area. Some new industries like sugar and paper are, however, now coming up.

Transport and Trade

The region suffers from lack of adequate means of transport (Fig. 21.6). It is provided with very poor railway facilities. Railway was introduced here in 1890 when Jharsuguda-Raigarh section was opened. Consequently, Jharsuguda-Sambalpur branch (1893), Tatanagar-Gurumahisani Rly. (1911) and Talcher-Nirgundi section (1927) were opened with definite purpose of raw material supply. Raipur-Vizianagaram railway line touching the Titlagarh Kausabauji area of Bolangir was opened in 1930-31. Sambalpur was joined with Titlagarh in 1965 and this line passes through an important agricultural area. In this region railway line has been laid down at different stages and irregularly. These systems carry more minerals, forest products, agricultural produce and finished products from different industries such as steel, fertilizers and cement etc.¹⁰

There are vast areas of Phulbani, Dhenkanal, Sambalpur, Sundargarh and Keonjhar without railway; Baudh-Khondmals has no railways. Sundargarh has the highest share in consideration of its area and population, followed by Bolangir while Keonjhar has the lowest proportion. Proposals to link the rich mineral and forest areas have been made.

The existing system of roads in the region is very inadequate and far from satisfactory. Large number of streams with frequent floods make the condition still worse. N.H. 42 runs through Cuttack-Angul-Sambalpur while N.H. 6 passes through Bargarh-Sambalpur, Barkot-Keonjhar towards Calcutta. State roads join the district and sub-divisional headquarters and industrial centres like Rourkela. Besides; there are also district and village roads joining the market places with towns and administrative centres. The Five Year Plans have tried to link all important towns and village centres with at least fair-weather roads.

Water transport is not possible in any of the

rivers in the region. Nagpur-Calcutta Air service touches Rourkela twice weekly.

Trade and commerce of the region has got very bright future because of the rich industrial potentials. Raw materials and forest products were till recently the main articles of trade but now they are changing to finished goods. Steel and fertilizers with some chemicals and engineering products may lead the trade of the region.

The Regions

Orissa highlands can be divided into lower order regions, on the basis of the peculiarities and differences in geological, physical, climatic and edaphic conditions. Further, the regional boundaries have been adjusted according to the difference in economic activities like the agricultural pattern, population density, mode of economy and social organization, transport and communication facilities and above all the degree of mineral-industrial development. As such, 3 first order, 7 second order and 22 third order regions are distinguishable (Fig 21.12).



Fig. 21.12 The Regions

XX. Orissa Highlands

44. North-Eastern Hill Region

(a) North-Western Rolling Upland
or
Rajgangpur-Jharsuguda Basin

- i) Rolling Upland of Brahmani Basin
 - ii) Jharuguda Rolling Upland
- (b) Garhjat Hills
 - i) Bonai Hills
 - ii) Bamra Hills
 - iii) Athmalik Hills
 - iv) Brahmani Basin
 - v) Keonjhar Plateau
- (c) North-Eastern Plateau
 - i) Baitarani Upland
 - ii) Baitarani Basin
 - iii) Simlipal Upland
 - iv) Bamangarh Upland
- 45. *Middle Mahanadi Valley*
 - (d) Hirakud Sonepur Valley Region
 - i) Sambalpur Region
 - ii) Sonepur Region
 - (e) Baudha Valley Region
 - i) Baudha Valley Region West
 - ii) Baudha Valley Region East
- 46. *South-Western Hill Region*
 - (f) Hirakud-Bolangir Basin
 - i) Bargarh Uplands
 - ii) Bolangir-Titlagarh Region
 - (g) Orissa Ghats Region
 - i) Khondmal Hills
 - ii) Nayagarh Hills
 - iii) Vamsadhara and Rushikulya Upland North
 - iv) Vamsadhara and Rushikulya Upland South
 - v) Rushikulya Basin.

North-Eastern Hill Region

The North-Eastern Hill Region is an extension of the Chotanagpur plateau. The Brahmani and the Baitarani drain the region and dissect it into three blocks. The eastern block is a plateau, consisting of the heavily forested hills of Mayurbhanj district where the dome-like Simlipal and Meghasani mountains (1,200 m) have given rise to radial drainage. The middle block is also a well-forested hilly region which occupies most of Keonjhar district and parts of Dhenkanal and Sundargarh districts. The western block of the plateau is flat-topped and steep-edged with dense forest over some parts. The general slope of the

region is from north to south. Most of the region receives above 1,500 mm of rainfall. The most important and differentiating characteristic of this region is its rich endowment of iron ore, coal, limestone, chromite and dolomite, which are of considerable industrial significance. The hill region is included in the submontane zones and mostly have a rolling undulating topography with elevations varying from 150 to 900 m and above. The coarse gravelly soil gives poor yield as compared to the coastal plains and river valleys. The undulating topography with a hard subsoil rock has afforded the best conditions for the tank irrigation system. The patches of forest are not uncommon here. The high plateaus, hills and mountains were of little economic importance and considered as the regions of refuse in Orissa. But they have now become the principal sources of supply of several forest and mineral resources. The mountainous tract has always remained thinly populated because of its low carrying capacity.

Red soil is found in the entire region except a small area of about 250 km² in the north-east of Hirakud reservoir. There are deposits of iron-ore, manganese, limestone and other minerals as a result of which some large scale factories have sprung up. Sal forests have further enriched the industrial potential of the area. The region is sparsely populated with an average density of 90 persons per km² (1961). The north-western portion of the region from Brajrannagar to Rourkela accounts for heavy concentration of rural and urban population. Rourkela is the biggest urban centre developed as steel town. The region enjoys comparatively better transport facilities. This region can be divided into three sub-regions. *North Western Rolling Uplands* or *Rajgangpur Jharuguda Basin* has mostly a rolling undulating topography with elevations varying from 150-300 m. It has good forest and mineral wealth. The region has two sub-regions: (i) *Rolling Uplands of Brahmani Basin* occupies the eastern slopes of the Mahanadi-Brahmani interfluvium and the Panposh plain. The western and middle regions of this area are of little economic importance, but the Panposh rolling upland is not only agriculturally advanced but also industrially developed. The

Rourkela Steel Plant and the steel township has opened a new phase of development here. Rajgangpur and Birmitrapur are the other two important industrial urban centres in the region.

(ii) *Jharsuguda Rolling Upland* is drained by the Ib and its tributaries and extends from Sundargarh in the north to Sambalpur in the south. The region is predominantly a rich rice-growing area. Here pulses, cereals, sugarcane and to some extent cotton are also cultivated.¹¹ After the completion of Hirakud project this rolling upland has developed some industries also. The density of population is high. Jharsuguda (multi-functional town), Brajrajnagar (industrial) and Sundargarh (service centre) have developed as important centres in this area.

Garhjat Hills : This is mostly the mountainous part of the north-eastern hill region. The trend of the mountain ranges is from north to south; they act as divides between the Baitarani and Brahmani and the Brahmani and Mahanadi. The region has got several peaks with their heights more than 900 m. It has been further subdivided into five sub-regions : (i) *Bonai Hills* region has got a cluster of hills acting as the northernmost dividing range between the Brahmani and the Mahanadi. This region is higher than the southern hill ranges. Here the forests are thick with predominance of bamboo. (ii) *Bamra Hills* constitute the middle part of the divide between the Brahmani and the Mahanadi. This region is well dissected by the tributaries of the Mahanadi and Brahmani and therefore, is lower in elevation than its northern part. Thick growth of bamboo due to high rainfall is the main feature which can be marked here. Deogarh is the service town of commercial and historical importance. (iii) *Athmalik Hills* are the southernmost part of the dividing range between the Brahmani and the Mahanadi. This region is highly dissected and is very low in elevation. A number of isolated hills with lower peaks characterise the region. It is also forest-clad, and has some agricultural activities, particularly in the tributary valleys. (iv) *Brahmani Basin* is drained by the middle Brahmani and stretches almost north to south. The river valley and the flood plain in its upper part are narrow

with torrential streams on either side. Monadnocks and big rock outcrops are frequently met with. The erosion exceeds deposition here. Crop combination slightly tends more towards inferior cereals like maize and pulses. The isolated hills are clothed with forests. The lower basin region is broad in extent and there is tendency for deposition in the river bed. Floods are frequent here. This part is a plain where rice predominates and density of population is higher than in the upper basin. Talcher is a mining centre and Dhenkanal the district headquarters; Bhuban is also a service centre. (v) - *Keonjhar Plateau* is the western part of the dividing range between the Baitarani and the Brahmani. There are several peaks of which Malavagiri and Badamgarh, are important. Shifting cultivation practised by the Bhuiyas and Juangs has led to severe soil erosion. Forests are of tropical moist deciduous type. The region contains important deposits of iron, manganese and mica ores in the Mankarnacha hills. The rich haematite ores of Taldiha are used in Rourkela steel plant. Keonjhar is administrative-commercial town with some industries.

North Eastern Plateau : This region is drained by the Baitarani and presents unique features of a high plateau ranging in height from 300 to 1,200 m. Agriculture dominates the economy. Due to deforestation soil erosion has been initiated, but the flat topography has limited this menace only to the steep slopes. Here the dome-like hills have given rise to a radial type of drainage. Rice is the main crop of the region. The topography offers a serious obstacle for the lines of transport, especially from east to west. Rich deposits of haematite iron ore occur in Gurumahisani hills and Badampahar region which supply to the TISCO at Jamshedpur. The region can be further subdivided into the following four sub-regions : (i) *Baitarani Upland* forms the eastern flank of the Baitarani-Brahmani divide. Some monadnocks with flat plateau surfaces form a typical topography of the region. Agriculture forms the main economy. Shifting cultivation is prevalent in some of the hills. Mineral deposits (iron ore, manganese)

have made the region potentially rich. (ii) *Baitarani Basin*—is built-up by the joint operation of the Baitarani and the Salandi. It carries a higher population per acre of cultivated land. The soil is enriched by annual inundations which leave behind thick layers of silt. It is an agricultural region and awaits development by the proposed Salandi development scheme. (iii) *Simlipal Upland* is the common interfluvium of the Subarnarekha, the Budha Balanga and the Baitarani and has radial drainage pattern. It also receives rainfall in winter and is clad with forests. Valuable sal trees predominate. Silviculture dominates the agriculture and it is hoped that it can be better utilised by transport development in the region. (iv) *Bamangerb Upland* is quite different from the Simlipal Upland as it drains to the north and morphologically it is completely cut-off from the other drainage systems of Orissa. It is also more densely populated and is also important for its mineral resources. Rairangpur is the only main centre of commercial activities. Forest cover is quite predominant here.

Middle Mahanadi Valley

It is narrow and elongated and extends from Hirakud to the head of the delta, being wider in its western section and narrower over most of its eastern parts. The carrying capacity of the land is low compared to the coastal plains. This tract mainly covers the parts of Bolangir, Sambalpur and Dhenkanal and contains some of the fertile parts of the region. The valley is demarcated by the 150 m contour. Red and black lateritic soils cover the valley. The average annual rainfall range is between 1,400-1,500 mm. The Hirakud project has provided power for industries and irrigational facilities to lower parts of the area. Average density of population is about 100 persons per km². Sonepur is located at the confluence of the Tel and the Mahanadi. Further east, on the bank of river Mahanadi is the old state town of Baudh which is a sub-divisional headquarters and service-cum industrial town. The old trade routes passed through the valley from the coastal plains to the upper reaches of Mahanadi in Chhatisgarh basin. This region can easily be

divided into two second order regions: *Hirakud-Sonepur Valley Region* is the plain lying between Hirakud and Sonepur. This region is different from the *Baudh Valley Region* in that it comprises deep elongated valleys of the Tel, the Ong, etc., on the right bank of the Mahanadi. The plain is fertile, canal-irrigated and predominantly rice-growing region. Food-processing and other industries have added to its economic growth. Sambalpur, Hirakud (industrial) and Burla are the important urban centres. Sonepur in Bolangir has long been known as a trading centre. As based on the urban-commercial influence of the respective towns, *Sambalpur* and *Sonepur* regions become distinct third order units. *Baudh Valley Region* is the lower part of the valley region. Agriculturally it is less prosperous and grows rice and millets. Its eastern portion is very narrow as compared to its western portion and as such two third order units, *Baudh Valley Region West* and *Baudh Valley Region East* can be well-marked. Baudh, Athmalik and Hindol are the sub-divisional headquarters with growing urban characteristics. The whole area is sparsely settled. Its development is awaiting irrigational and power facilities.

South Western Hill Region

South of the Mahanadi valley is the last lap of the great line of Eastern Ghats and towards southwest is the sub-mountainous part characterised by rolling topography with some open valleys which are highly fertile. Agriculture is predominant occupation with rice as the main crop. Extensive areas of the western parts are double-cropped. Sugarcane is widely cultivated by tank irrigation. Lateritic and red soils predominate in the entire region with patches of brown and black soils. Population density is more than 90 persons per km² in the Western Uplands and less than 75 in the Eastern Ghats and hilly tracts. This region can be divided into two sub-units: *Hirakud-Bolangir Basin* in the northwest is quite different from the rugged and the least populated *Orissa Ghats Region*. *Hirakud-Bolangir Region* has an undulating topography interspersed with rich fertile river valleys. Rural population density is relatively high. This region can be further

sub-divided into (i) *Bargarh Uplands* and (ii) *Bolangir-Titlagarh Region*, separated by the Suktal-Ong divide. The Bargarh Upland area is drained by the Jira, Jhaun, Ong, etc. This land is fertile with adequate rainfall and is surplus rice area, popularly known as rice bowl of Sambalpur. Double cropping is a common practice over an extensive area with tank and canal irrigation. Sugarcane and cotton are important cash crops. A cotton mill, a sugar mill and other industrial undertakings tend to change the landscape in future. Bargarh is an important industrial and service centre. *Bolangir-Titlagarh Region* is drained by the Tel. It is a sparsely populated agricultural region but not so prosperous because of lack of irrigation facilities. Rice is the principal crop. Pulses, cotton, sugarcane are also grown. Forestry is the secondary occupation. Bolangir is the regional centre while Kontabanji and Titlagarh are other commercial towns. Palnagarh is a collecting centre.

Orissa Ghats Region : It is a low hilly tract, (average elevation 300-450 m) in the northernmost part of the Eastern Ghats, lying to the south and the southwest of the Mahanadi river valley. The area is dissected by the Vamsadhara and Rushikulya systems. It has comparatively lower rainfall and is sparsely populated. It can be subdivided into five third order units : (i) *Khondmal hills* are more dissected and extensive than the (ii) *Nayagarh hills*, both being sparsely populated. Nayagarh hills have a ghat-like eastern face towards the coastal plain. Phulbani, Baliguda and Bhanjanagar are the important service centres in these areas, (iii) *Vamsadhara and Rushikulya Uplands North* and (iv)

Vamsadhara-Rushikulya Upland South form other two units. These uplands extend from the west of the Eastern Ghats and are drained by the upper parts of these two rivers producing a rugged topography; the northern part is more dissected. Very poor agricultural activity is found in these regions. The predominance of negative areas has limited the extent of human settlement. (i) *Rushikulya Basin* has an undulating subdued relief with dense population. Soil erosion has become a problem. This region has got better road system. Rice is the chief crop with tank irrigation. Russellkonda and Aska are important service centres.

Problems and Prospects

Not unlike Dandakaranya and Chhattisgarh regions, the Orissa Highlands pose a problem of underdevelopment in an acute form. The Hirakud project and the Rourkela industrial complex have tended to provide facelift for some parts. The problems of development are mainly related to agriculture, forest and mineral resources. Agricultural productivity both in relation to land and working force is very low here because of relatively low crop yields which are due to age-old techniques, and poor irrigational and marketing facilities. The high pressure on agricultural land has to be lightened by developing other sectors of the economy. The region has considerable natural resources like minerals, forests and water. In order to bring about the desired growth of agriculture and industry, improvement in the infrastructure chiefly transport and power, is the minimum necessity.

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Dandakaranya region ($17^{\circ}50'-20^{\circ}30'$ N and $80^{\circ}15'-84^{\circ}0'$ E) marked as an 'unexplored and undefined territory' for a pretty long time and occupying an area of about 89,078 km² comprises parts of three States, e.g., the Bastar district of Madhya Pradesh, the Koraput and Kalahandi districts of Orissa as well as some parts of Andhra State including Yellavaram and eastern half of Chodavaram (Rampachodavaram) tahsils of East Godavari district, Chintapalli and Paderu tahsils of Vishakhapatnam district and Salur and Parvatipuram tahsils of Srikakulam district (Fig. 22.1). The region extends for about 480 km from east to west and 320 km from north to south.

The region is almost a well-demarcated physical unit representing the dominant plateau character.

It enjoys a central location between the Chhattisgarh Basin in the north, Andhra Plateau in the south, Maharashtra Plateau in the west and the Eastern Coastal Plains towards the east. On the three sides, the administrative boundaries of Bastar, Kalahandi and Koraput districts delimit the Region; since the Eastern Ghats abut sharply and steeply towards the East Coastal Plain, the 300 m contour has, tentatively been taken as the eastern limit of the Region.

Historical Background

In the maps of mid-19th century (1860)¹, the Dandakaranya was a large triangular tract, covering the eastern portion of Northern Sircars, the major parts of adjoining State of Hyderabad,



Fig. 22.1

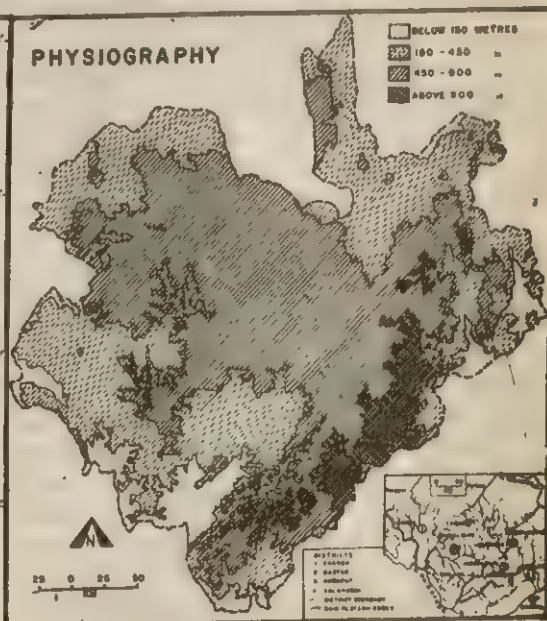


Fig. 22.2

the Bastar State in Madhya Pradesh and the Jeypore Zamindari in Orissa, which includes the Araku Valley and Malkangiri Plateau of Koraput district. The triangle is centred roughly on Kanker, formerly the capital of the State of the same name and is contained within the area bounded by the Wardha, the Godavari, the Sileru and a curved line from the upper reaches of that river through Bhawani Patna to near Sambalpur in the north east (Fig. 22.2 Inset).

As regards the identification of its territorial limits, some consider this region as far west as Nasik, the abode of Rama in the forest on the bank of the Godavari and suggest the coincidence of Dandakaranya with modern Maharashtra.² A few scholars, alternatively, claim that ancient Dandakaranya covered a very large area of Central India from which the forests have gradually been cleared by man.³

The name Dandakaranya derives from an alleged identity with the 'Dandak forest' of the epic 'Valmiki Ramayana', where the demon *Dandak* held his sway.

History reveals the fact that Dandakaranya was ruled by the Nal Dynasty. The stone inscription extant in Podagarh (Koraput) bears testimony to this fact. The gold seals of this dynasty have also been found in 'Adnega village' of Kondagaon tahsil (Bastar District).⁴ Koraput, Umarkote and Paundagarh (Podagarh) formed, till the beginning of the British rule, part of Bastar State, the heart of Dandakaranya.

The Vakatah queen Prabhavati Gupta, the daughter of Chandragupta Vikramaditya II, had established her kingdom's capital at Nandpur which is probably the same as Nandpur township in Koraput district.

The *Chitrakot* or *Chakerakut mandal*, known as Bastar State since the 15th century, was ruled by the *Chalukyas*, *Kared Kakatiyas* and *Chhindakenagas* in the ancient days. In Chitrakot the *Chhindakenagas* were followed by Annam Raj who gave the name Bastar to it which appears to have been derived from the Sanskrit word '*Bestitar*' or '*Bri-better*'. Annam Raj is identified as a Kakatiya ruler, testified through a rock inscription in Dantewada of the early 18th century. But, on the

contrary, the copper plate found in Rajahmundry and of Teensau Brahmins provide conclusive historical evidence that Annam Raj and his last successor Raja Pravir Chandra Deo, who ruled till the inauguration of the Republic, were Chalukyas.

In succeeding centuries, Jain and Christian missionaries and the devoted followers of the saintly Chaitanya Mahaprabhu penetrated the remote fastnesses of these ancient forests and tried by their sermons to bring the solace of religion to the aboriginal tribes whom Rama had encountered on his journey and whose pattern of thinking and way of life had remained unchanged through the ages.

Successive Aryan invasions had driven the ancient forest dwellers in the remote past still deeper into the forest-clad hills of Bastar and Koraput. Here they lived on the bounty of the forests a very primitive and tribal way of life, beyond the reach of the tides of progress which swept the country.

The Physical Setting

Physical Landscape

Dandakaranya, on the whole, has an undulating topography with well-marked elevations and depressions. While the region, on the one hand, represents typical wide forest-clad plateaus and hilly tracts including highly dissected plateaus and the Abujhmar Hills in the west and the Eastern Ghats mountains, known as Mahendragiri in ancient times after a peak of that name which is about 150 m high, in the east, there are a few extensive plains also comprising a part of Chhattisgarh Plain in the north and Godavari-Sabari Plain in the south west. The plateaus, however, are dominant landform of the region, covering about two-fifths of its area.

The plateaus extend throughout the region except for the portion of the Koraput district occupied by the Eastern Ghats. The hills abruptly rising on the eastern side gradually lower down on the west. The Ghats end at Koraput where the elevation is about 900 m which gradually decreases to about 600 m in the Umarkote region. They further lower to about 300 m and 200 m in the

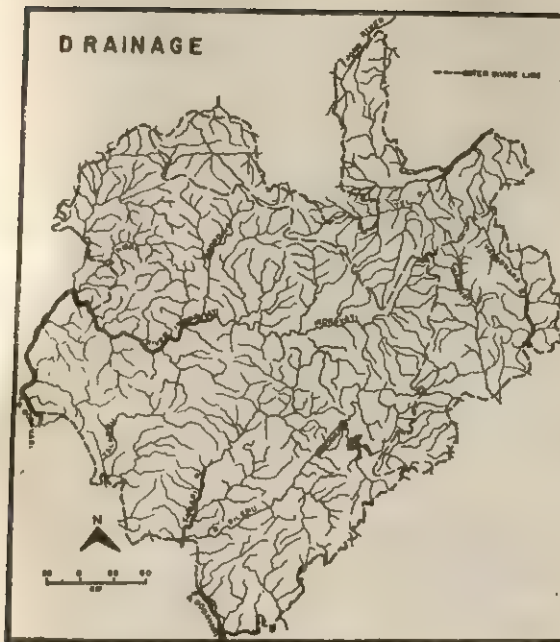


Fig. 22.3

Paralkote and Malkangiri zones respectively, (Fig. 22.2).

The plateau topography is most evident in the Bastar region; right from Jeypore ghat the long axis of Bastar Plateau stretches away for about 190 km at an elevation ranging from 550 m-750 m to Keskul Ghat where an abrupt descent to the Kanker Basin is observed and where the width of the plateau, approximately, varies between 80 km and 130 km. Consequent upon almost general internal relief, the plateaus are slightly dissected with the existence of fretted scarps in the east and north due to the deep and narrow cutting by the tributary streams. But they are highly dissected on the west by the tributaries of the Godavari including the Indravati.⁵ The western dissected edge of the Bastar Plateau, lying to the north of the Indravati is marked by the Abujhmar Hills which provide one of the richest iron ore deposits of the country at Bailadilla Range, but much of the Bastar Plateau is undissected, formed of the gneisses of the Dharwar and Cudappah Systems. The Bastar Plateau drops on all sides except in the



Fig. 22.4

south-east (bordering the Eastern Ghats), where they are considerably eroded to form the Godavari Plain (Fig. 22.2 Inset).

To the east of the well-marked scarp edge of the Bastar Plateau extends the Kalahandi Plateau ranging from 250 m to 300 m in elevation. Drained by the Tel, Udanti and other tributaries of middle Mahanadi, the Kalahandi Plateau tapers into the Tel Valley towards the north-east. To the north west of the region lies the Kanker Basin (450 m), a southward extension of the Chhattisgarh Plain, crossed by a few higher ridges of quartzites. Another extensive plain spreading in the south-western portion of the region, designated as Godavari-Sabari plain, is drained by the tributaries of the Godavari, chiefly the Sabari and Sileru. This plain has undergone different nomenclatures by various scholars, notably Great Southern Plain⁶ and the Malkangiri Plateau.⁷

Drainage

The drainage of Dandakaranya may be classified into two systems: (i) the Mahanadi river system in the north draining the northern parts of both

Bastar (Kanker Basin) and Kalahandi (Tel Valley) districts and the (ii) Godavari river system draining about three-fourths of the region including the Central Plateaus and the Southern Plains; a part is also drained to the Bay by the Nagawati and the Vamsdhara (Fig. 22.3).

The Mahanadi River System : The Tel, Jonk, Udanti, Hatti, and Sandul, the tributaries of the Mahanadi, drain a major portion of the Kalahandi district. The Tel and Jonk are the most important tributaries, rising from the hills of the Eastern Ghats. The Ret and the Udanti take their rise in the north-western hills of Nawapara tahsil of Kalahandi district and flow towards east.

The Godavari River System : The Godavari, the biggest of the east-flowing rivers of the Peninsular India comes in contact with the south-western limit of the region for about 16 km where it coincides with the Bastar district boundary near Bhadrakali. Since the Godavari flows through high lands on both the sides, its valley is narrower at this place than in the lower reaches.

The Indravati, a major tributary of the Godavari, flowing through the central part of Dandakaranya region, with about 41,665 km² catchment area in M. P. and Orissa rises at an altitude of 915 m in the Kalahandi district on the western slopes of the Eastern ghats.⁸ It flows westward through Koraput and Bastar districts, turns south and joins the Godavari about 530 km from its source at an elevation of 82 m near Bhopalpatnam. At Chitrakot, about 40 km west of Jagdalpur, the Indravati, while descending from the quartzitic sandstone to the Archaean granite and gneisses, makes a 30 m waterfall. Also it makes a few rapids towards further west from Chitrakot.

The major tributaries of the Indravati are the Narangi, Boardhig, Kotari, Bandia and Nibra flowing from its right and Nandiraj as well as Dantewara from the left. On the north the Narangi and Boardhig drain the north-eastern plateau while the Gudra flows through the eastern Abujhmar hills. The Abujhmar hills lying between the Indravati, the Gudra and the Nibra exhibit radial drainage pattern. The southern tributaries of the Indravati, the Dantewara, Nandiraj, Berudi and Chintavager, smaller than the nor-

thern ones, drain the Bailadilla and Usur Hills as well as the slopes of the southern plateau of Bastar.

The Sabari (also known as the Kolab), another important tributary of the Godavari, rising at an altitude of 1,372 m, in Sinkaram hill range of the Eastern Ghats, drains the southern uplands of the Dandakaranya region. The Sileru or the Machkund, a major tributary of the Sabari, rises at an elevation of 1,220 m and flows for about 306 km before joining the Sabari above its confluence with the Godavari. The Sabari and Sileru together cover a catchment area⁹ of about 20,427 km². The Kanger and Malengar are the two other important tributaries of the Sabari. The former rises at Tangiri and the latter in the Bailadilla hills. Both flow towards south to join the Sabari. The Kanger makes a water fall (45 m) at Tirathgarh while descending from the Cuddappah quartzitic sandstone.

The Nagawati and the Vamsdhara drain the easternmost peneplain of the region. The latter takes its rise in the Eastern Ghats near Ambodala in Kalahandi district and falls into the Bay flowing from north to south through the Parvatipuram and Salur tahsils of Andhra Pradesh.

Most of the rivers of the Dandakaranya region are perennial though with highly fluctuating regime. Very negligible amount of their water is used for agriculture. The local nalas and streams are seasonal and dry up as soon as the monsoon ends. Due to rapid run off and evaporation, the land is very quickly dried up after the monsoon. The topographical and stratigraphical features indicate that the region is mostly deficient in underground water resources.

Climate

The entire Dandakaranya region, lying within the tropics, is characterised by hot and humid climate. The temperature varies from 19°C in the coldest month, December to 31°C in May, the hottest month, showing a considerable annual range (12°C).

The rainfall in the region characteristically occurs between June and September, ranging between 125 cm and 150 cm. The period between December to February remains generally

dry. The region, however, suffers from uneven distribution, unreliability and uncertainty of rainfall. The Uplands receive more rainfall during summer than the plains and valleys. While the Kanker Basin and Tel Valley in the north and the Godavari-Sabari Plain in the south-west are too hot, the Bastar Plateau and the Eastern Ghats remain relatively cool. In winter months, the plains become pleasantly cool whereas the plateaus and hills are fairly cold. During rains, while the plains are unpleasantly warm and sweating, the highlands enjoy comfortable weather due to frequently blowing winds.

The rainfall, fairly heavy though irregular and unevenly distributed, is mostly caused by the south west monsoon. The sporadic rains, especially during winter months are of negligible significance from the view point of agriculture.

The variability of rainfall from normal is relatively high, but since the annual precipitation is fairly high, floods are bigger menace than drought. Such climatic conditions are essentially suitable for growing selected crops such as rice, sugarcane, jute and pulses, etc.

Due to the moist and hot climate, the region is very much prone to malaria, blackwater fever and various intestinal diseases, which take a heavy toll.

Natural Vegetation

Although the implementation of Agriculture Extension Programme recently in many parts of Dandakaranya has resulted in deforestation and clearing of original forests with a view to increasing cultivable land, the region appears to be exceptionally rich in the forest wealth, mostly confined on the Upland rims and the Eastern Ghats. The typical cover is of the moist tropical deciduous forests, 'sal' being the most dominant species. In the drier and hotter Malkangiri Plateau and the adjoining areas the moist deciduous species are replaced by drier teak forests.

About 40.2 percent of the total area is forested.¹⁰ Bastar is the most densely forested district with 57.8% of its area under forests; contributing to nearly 72.9 percent of the total forest area of the Region; Koraput (14%) and Kalahandi (13%) contribute the remaining.

Apart from the teak and sal forests which predominate in the region, the other common species, including the minor produce, are almost the same as in Chhattisgarh region.

At present a high proportion of the forests in the region is either reserved or protected; over half of the Bastar district is covered with such forests. The shifting cultivation, as a destructive agent, has declined almost everywhere in the Dandakaranya region. The forest wealth is still one of its assets. The appreciable sale proceeds of timber and sal amounting to Rs. 1.43 crores (1962) is notable in Bastar Circle alone.¹¹

Soils

Adequate and systematic record about the characteristics of soils of the Region is hardly available. The soil types, however, vary widely depending on the configuration of surface. While the peaks of the region have bare rocks almost devoid of vegetative cover, the plateaus and hill slopes contain rocky soil with thin veneer of loam and the plains and valleys are characterised usually by fertile alluvium. Major part of arable land in Eastern Ghats contains mixed red and black soils deficient in humus, nitrogen, phosphoric acid, potash and lime.

Extremely porous and generally sedentary type of soils are formed through the weathering of metamorphic rocks, e.g., schists and gneisses, and are generally deficient in plant nutrients with low pH value (5.5 to 6.5). They are generally red with patches of grey colour, being too shallow with very little clay content. Being less moisture-retentive, they are unable to sustain Rabi crops except under very favourable conditions. Even the recently reclaimed agricultural tracts suffer from humus deficiency consequent upon the frequent practice of burning the undergrowth by the tribal people for centuries.¹²

However, the parent rock, slope and other factors produce a great variety of soils in different parts. The Dandakaranya Uplands contain red soils rich in iron content and formed mostly due to the weathering of granitic and gneissic rocks. The uplands have poor, light coloured and thin soils while the valleys have more fertile, fine, dark and deep soils.

The Dandakaranya Ghats, where the hills slope gently to the west into plateaux dissected by river valleys, have laterite soils poor in plant nutrients, especially potash and phosphate but rich in nitrogen.

In the Paralkote zone the soils are deep, sandy or clay loams on the surface with a heavier B₂ horizon, but in the remote and unburnt forest, the surface contains a thin layer of organic matter. In the Umerkote zone there are some areas of good red loams, more sandy than those of Paralkote though being heavier in the valley bottoms. In the Malkangiri area are found the sandy clay loams with a few patches of black soil.

The problem of soil erosion is quite serious in certain areas, particularly in the Eastern Ghats and the Bastar plateau. The existing practice of *Podu Chasa* (jhuming) down the slopes, especially by the *Adivasis*, leads to depletion of the forests resulting in intense soil erosion. The anti-erosion measures such as contour bunding, terracing, strip-cropping, gully control, and field-bunding are necessary to prevent the erosion in both open as well as undulating areas.

Mineral Resources

Mineral resources constitute the most valuable asset to the region; of the known minerals, bauxite (0.65 million tons), iron ore (2,000 million tons), limestone (213 million tons), manganese and glass-sand or quartz (6 million tons) are important for their reserves.¹³

The iron ore deposits are the most important mineral occurrences of the region. One of the richest iron-ore deposits of the country occurs here at Bailadilla Range of Bastar district. Out of the total estimated reserve of 21,300 million tons in the country the Dandakaranya alone has about 10%. Although iron ore deposits have been reported from the region, the most significant is that of Bastar; Koraput and Kalahandi, each 10 million tons, are of lesser significance. Bailadilla Iron Ore Series resemble the Iron-Ore Series of Singhbhum and Orissa. These deposits lie at about 104 km from Jagdalpur and 392 km from Raipur stretching for about 48 km in length from north to south. The flat tops of the

ridges are the main iron ore blocks. The iron-ores are associated with banded haematite quartzites and ferruginous schists of the Bailadilla Iron Ore Series (Fig. 22.4). Another laterite-capped iron ore band similar to Bailadilla, known as Rowghat deposits, lies in Narainpur tahsil close to the Antagarh-Narainpur Road. They are mainly haematite with some limonite at places and occur in the precipitous hills of 450 m elevation.

In Koraput, apart from several scattered occurrences, the important iron-ore deposit (mostly haematite) is on the northern slopes of the Central portion of the Hirapur hills at about 8 km south-west of Umarkote and 5 km south of Kumari. The low grade iron ore deposits of Kalahandi occur near Kholygaon and Mahuabata.

Large limestone deposits occur in the region at several places in Bastar and Koraput districts, with large reserves (1,045 million tons).¹⁴ Significant deposits of bauxite, though not of high grade, occur in the Chandgiri-Karlaket belt of Kalahandi. The possible reserves in the entire region are about 1.2 million tons. Important occurrences of manganese ore are in the Koraput and Kalahandi districts, mined in Kutingi area on the Rayagada-Koraput road and being utilized for the ferro-manganese at Rayagada.

Two important deposits of quartz and quartzites are known to occur in Ziram area (reserves 5.7 million tons) of Bastar district and near Dalapur in Koraput. China-clay and pottery clay deposits are confined mostly to Koraput near Jeypore to the Sw of Damasguda and also near Dudhijholla. In Bastar, small china-clay deposits occur in Maganpur, Madpal and western Kukra-Dogri areas. In Kalahandi, Lithomorphous clays are quarried near Sandala and Lukopalli.

The Cultural Setting

Population

The region is one of the sparsely populated parts of India : with a total population of about 4.2 million in an area of 89,078 km² and a density of 46 persons per km²; it is much less densely settled than the constituent States of M.P. (177)

and Orissa (113). Bastar has quite naturally the lowest density (32) which increases somewhat in Koraput (52) but more appreciably in Kalahandi (82), a district which carries some expanse of plain area.

The population of the region is concentrated in the plains, low lands and the isolated basins which have the coincidence of good soil cover, water and in many cases better accessibility, while the high lands all around are very sparsely inhabited. The forest-covered portions are almost devoid of habitation, excepting a few 'forest villages' scattered in the forest clearings, carrying *podu chasa*. Even in the least populated Bastar district, the Kanker and Kotri plains in the north-west (Bhanupratappur and Kanker tahsils), Indravati plain (Jagdalpur) and Dantewara and Sabari plains (North Dantewara and Konta) are more thickly populated, while the isolated parts like Kondagaon tahsil (N.E. Plateau), and southern Dantewara, (Dantewara plateau) inhabited by the *Adivasis*, are sparsely settled. Being inaccessible, the S.W. Bastar, including the Abujmar Hills and the low Bijapur Plateau, is very thinly peopled.

In the Kalahandi region the north-eastern plain (Tel Valley) around Bhawanipatna in the north, Nowrangpur in the Indravati valley in the south-west and Rayagada area in the south-east are thickly peopled, while the portions of Eastern Ghats are deprived of any considerable population. Similarly the Koraput district is also more populated on the western margins along the north Sileru Valley around Jeypore, Koraput and Machkund towns. The Salur, Parvatipuram, Paderu, Chintapalli, Yellavaram, and eastern half of Chodavaram tahsils of Srikakulam, Vishakhapatnam and East Godavari districts of Andhra Pradesh, exhibit fairly high concentration owing to relatively level topography. The areas around the headquarters of Salur and Parvatipuram tahsils of Andhra are the most densely inhabited parts of Dandakaranya.

Trend of Population Growth : The neglected plateau of Dandakaranya did not experience any notable increase of population till the middle of the present century. However, the last decade (1951-61) witnessed a rapid (about 17.5%) growth

of population, due mainly to the Rehabilitation Programmes of the displaced persons from East Pakistan on the government initiative and consequent economic development. It was after the year 1958 that the immigrants in large numbers were rehabilitated in the newly established colonies of the Resettlement Zones by the D.D.A.

The region has more or less a balanced sex ratio with the females (1.84 million) slightly exceeding the males (1.83 million). Agriculture is the chief occupation, engaging about 83% of the working force. The industries including household and manufacturing employ merely about 5.8% while trade and commerce (1.3%) and transport (0.37%), are also insignificant as employment channels. Rest of the working population (9.5%) is engaged in miscellaneous services. Majority of female workers of the region actively participate in the paddy cultivation and other works.

The Adivasis : Socio-Economic Analysis : The hills and forests of Dandakaranya are the home of about 2.1 million *Adivasis*, constituting about 50% of total population of the region, and about 61%, 72% and 33.3% of that of Koraput, Bastar, and Kalahandi districts respectively. They are the 'first people' of the area. Centuries ago, these primitive people settled in the fertile alluvial plains of the north but were driven out by other superior tribes and more particularly the Aryan invaders into the remote isolated and densely forested hilly tracts of Central India. Their primary activity is almost confined to the primitive type of cultivation, collection of forest produce and hunting.

The main tribes of Dandakaranya are the Gonds which include *Mariyas* and *Murias* occupying mainly Bastar district, and the *Koyas*, *Bondas*, *Sauras* and *Parojas* in the Koraput district. These *Adivasis* have evolved their own unique culture, belief system, customs and a way of life, most of which are ecologically adapted to their environment. They have recently built for themselves a structure of tribal society, founded on folk-legal sanctions. The impact of a more sophisticated and advanced culture shakes the 'tribal society' and its members find these changes alien to their pattern of thinking and way of living. Pitiably,

the first contact of the tribals with the 'advanced culture' very often tends to make the former less honest and truthful and more conscious of their 'inferiority'.

The general recreation of these people is dance and music which are attuned to the domestic and agricultural activities, panorama of natural landscapes, changing season and not less revealingly the human passions and emotions wherein intricate gymnastics are obviously exhibited, particularly on ceremonial occasions.

One of the most peculiar social systems of the Dandakaranya tribes is the *Ghotul* prevalent among the tribals of Abujhmar hills of Bastar. *Ghotul* is like a club for unmarried boys and girls who live together, play games, sing songs, dance and thus loosen their inhibitions and get trained for their marital obligations.¹⁶ The divorces, remarriages and widow marriages are socially approved among them. Almost all tribals believe in the witchcraft and theory of transmigration. At every funeral, special ceremony takes place in order to ensure that the soul will be reborn in the same family. Stone or wooden pillars are often erected so as to commemorate the dead persons.

Rice beer is a common drink and Dasahara is the major festival of the *Adivasis*; on the occasion of *Choitra Purnima* also, they celebrate and enjoy. At the time of *Madiyas*, their annual fair, a large number of *Adivasis* from different parts, assemble and enjoy dances and songs and exchange wares.

Rural Settlement

More than 85% of the population is rural, varying from 58% in Koraput to 92% in Kalahandi and 97.6% in Bastar. There has been some decrease in the percentage during the last thirty years.

The types of rural settlement and their distributional and morphological patterns are closely associated with the physical features and the dominance of agricultural economy and tribal socio-economic structure. Characteristically there exist several detached blocks (*para* or hamlet) in a settlement, originated due to the ancient practice of usual shifting of habitations.

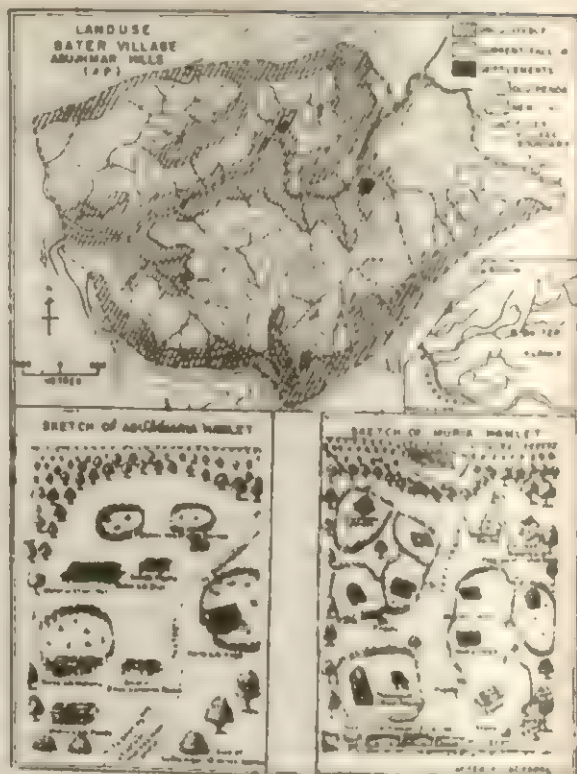


Fig. 22.5

Each *para* is inhabited by a particular caste or group. In the rugged, hilly and forested tracts of Bastar Plateau and the Eastern Ghats, the settlements are few, small and unevenly distributed, lying mostly in the agricultural pockets of forest clearings. The lower plateaus, plains and the valleys, with relatively greater expanse of cultivated areas and better water facilities, are characterised by dense settlement clusters of hamlet types. The forest-clad and higher Bastar plateaus, particularly the north-eastern and southern Dantewara areas, enclosed by Bailadilla and Tulasi Dongiri hills, have highly scattered nomadic settlements sustaining *podu chasa*. Each settlement has more than three hamlets spread over a considerable area and the physical shifts in sites take place because of widely available land for shifting cultivation.

The Kanker-Kotri Plain in the north, the Bijapur Plain in the south-west and the Godavari-Sabari Plains in the south, benefited through out-

side contacts, are occupied by larger villages having one or two large-size hamlets. The permanent cultivation in these plains has discouraged the practice of shifting the settlements.

Abujhmara Hamlets : Bater is a typical hamlet inhabited by Abujhmara tribesmen. Generally in an Abujhmara hamlet, the houses are grouped round a small oblong open space or along a foot-path and are commonly attached with a vegetable garden. A small hut occupied during the menstruation period lies behind the houses. A grain bin is constructed away from the houses on the grounds raised by wooden pillars. Also a separate pigsty lies near the house. *Ghotul* is the usual feature. (Fig. 22.5).¹⁸

A Typical Muria Hamlet : In Muria hamlets the houses are closely built and have a few more features than in an Abujhmara hamlet. Most of the houses lie on the sides of a main cart-track. In each group of houses the vegetable gardens adjoin each other and in every garden exists a house. Every family possesses a separate pigsty erected outside the garden. *Thana Guddi* (Rest house for the official and non-official visitors) comprising a house and a parlour, within a fenced enclosure, lies on the outskirts of the hamlet. The Village Mother's (Deity's) shrine, a swing and a flay-post are the important features of a Muria hamlet (Fig. 22.5). Murian *Ghotul* lies away from the residential huts for the sake of privacy and isolation. Except for the *Ghotul*, other features of the Muria hamlet mostly resemble those of other tribes namely *Bison-Horn Maria*, *Parja*, *Dorla*, *Bhatra*, etc.

The village houses are almost linear and erected on both sides of the rectangular open space. As regards the building materials, leaves, bamboo logs and mud are most common. The mud and wooden walls with thatch and wooden roofs are a general feature in the interior parts of the region. About 5-10% of the houses in the vicinity of the towns, however, contain tiled roofs with slightly superior structure.

Resettlement Programme and the Planned Villages : Up to Feb. 1970, under the initiative of the D.D.A., the Governments of Orissa and Madhya Pradesh have released 96,362 hectares of land for the

resettlement of displaced persons and landless tribals. In the four resettlement zones, 264 carefully planned villages have been setup by the D.D.A and 61 tribal villages have been established by the two State governments. The planned villages normally accommodate 40 to 60 families each and have such facilities as a tank, deep masonry wells, two or more tubewells, a head-water tank, a few internal and approach roads, a primary school and also in some cases a community centre. The services of a 'Sewak' (village level worker) are available to a group of 2-3 villages. Every village is within easy reach of a health centre providing free service. There is also provision of a mobile library-cum-publicity unit which screens films for the settlers and the *Adivasis*. The sports and games are encouraged among youngsters, with free supply of sports goods and musical instruments.

Birpur (Umerkote zone) village, which provides 40 houses for agricultural families and four for service personnel is a typical rehabilitation village (Fig. 22.6 B).

Urban Settlements

There are only 14 towns (1961) in the region, 2 in Bastar, 3 in Kalahandi, 7 in Koraput and 2 in the contiguous parts of Srikakulam district. All are small towns : Salur (26,111), and Parvatipuram (25,281) in Srikakulam, Jeypore (25,291) in Koraput and Jagdalpur (20,412) in Bastar are the most populous and significant urban centres in the Region. Majority of the towns owe their existence and functional structure to administrative services with which are attached some rural trades and other services and household industries, though most of them retain agriculture also to a significant degree. Jagdalpur, Koraput (7,461) and Bhawanipatana (14,300) are the headquarters of the Bastar, Koraput and Kalahandi districts respectively, while Kanker (6,487), Rayagada (14,537), Nowrangpur (10,380), Gunpur (10,180), Salur and Parvatipuram are the taluka headquarters (Fig. 22.7).

Barring the towns of Srikakulam district, among all other towns, Jagdalpur is the most significant one, although small as well as too young. Due

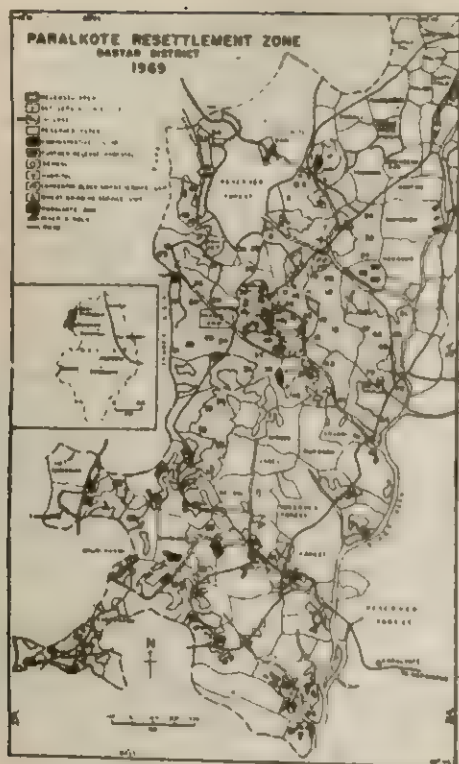


Fig. 22.6 A

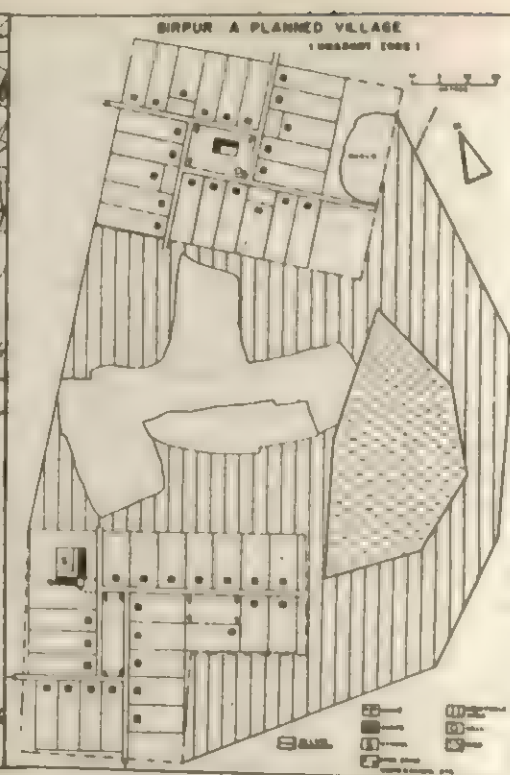


Fig. 22.6 B

to its central and strategic location it may be called the regional capital. Jagdalpur (9.59 km² area), founded by the Maharaja of Bastar about two and half centuries ago, has grown to be the biggest municipal town and chief commercial centre of the Bastar district. The commercial activity has clung to the Raipur—Jeypore Road and its

recent off-shoots. Among government offices, the district administrative offices and the establishments of D.D.A. are worth mentioning. The

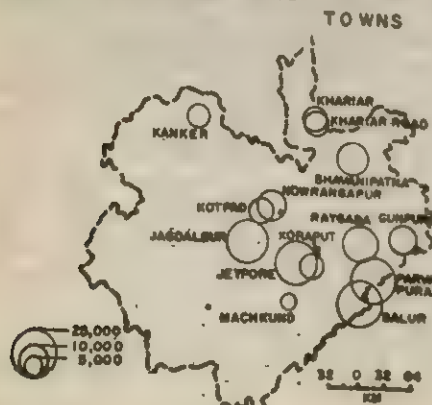


Fig. 22.7

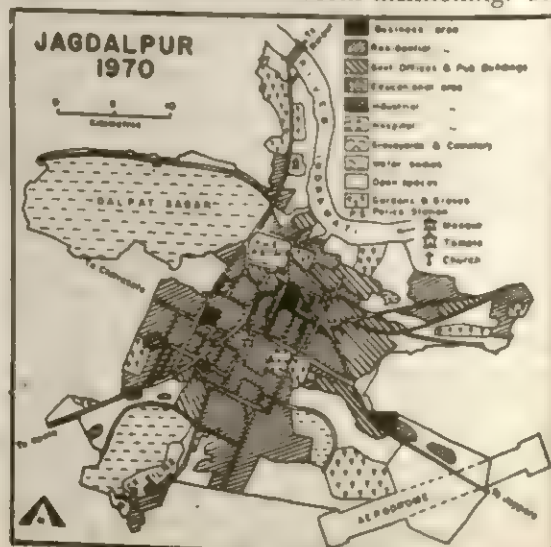


Fig. 22.8

town is credited with 4 higher secondary schools, 1 degree college, 2 hospitals, 5 banks, 5 cinema houses, about 50 small mills and factories (especially food and timber products), apart from several miscellaneous shops and restaurants (Fig. 22.8).

Koraput, though smaller than Jagdalpur in size, presents an altogether different morphological plan (Fig. 22.9). The town stands on an undulating surface. N.H. 43, connecting Vizianagaram and Raipur passes through the town.

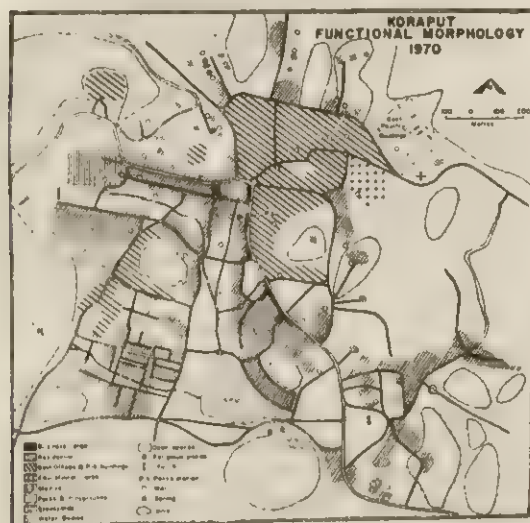


Fig. 22.9

The old Koraput lies about 1.5 km east of the newly planned township, which mostly comprises the D.D.A. establishment. The district administrative offices are scattered in the north, the circuit house and government high school in the north-west, and the staff and officer's colony in the south. The town is developing fast. It has wide streets and a press, flour mills, bank and health centres and several miscellaneous shops and restaurants. The townscape is very sparse with gradually emerging single-storeyed residential buildings.

Agriculture : The economy is predominantly based on primary occupation, e.g., subsistence farming and scattered mining, etc. Owing to difficult terrain, extensive forest cover (48%) and shallow soil, the net sown area covers only one-

fourth (25.6%) of the total. About 6.1% of the land is under fallows and 12.6% is not available for cultivation. Agriculture is almost totally dependent on rainfall and only 4.5% of the net sown area is irrigated. Gross cultivated area comes to only 27.2% of the total showing little double and multiple cropping.¹⁷

The principal crop is rice occupying 85.3% of total crop acreage; oilseeds (7.7), maize (2.6), jowar (1.2) and gram (1.0) are other crops. The region grows 0.58 mill. tons of rice, accounting for about 88% production of all crops in tonnage. Sugarcane occupies only 0.7% of the total cropped area. Groundnuts, mustard, linseed, *til* and castor are widely grown oilseeds.

Shifting Cultivation : In the tribal areas the practice of shifting cultivation (*Podu Chasa*) is very much prevalent. This wasteful primitive method of cultivation depletes valuable forest wealth and soil cover, and in the long run not only the productive capacity is lowered but even the physiography of the area is considerably affected.

The chief means of irrigation are tanks and masonry wells, though some newly constructed tube-wells have also augmented irrigation. The D.D.A., in this context has undertaken the construction of a few dams, storage reservoirs, tanks, tube-wells and deep masonry wells. Two medium-sized irrigation projects and 30 minor irrigation works are in hand. The Bhaskal dam and Pakhanjore reservoir have been completed, resulting in considerable transformation in the landuse of the adjoining areas. The Paralkote and the Satiguda dams have also been completed.

Chief Irrigation Projects in Dandakaranya¹⁸

Name of project	Culturable command area (in acres)	Total cropped area (in acres)
Umerkote Dam	13,750	16,500
Pakhanjore Dam	1,300	1,560
Paralkote Dam	32,500	39,000

The irrigation and hydroelectric potentials of the Indravati-Sabari basin, constituting a subs-

tantial area of the Dandakaranya, have recently been assessed by 'High Power and Technical Committee' and their development schemes are likely to be implemented shortly. The provision of village tanks (152), head-water tanks (151), masonry wells (406) and tube-wells (11,047) has also been recently made.¹⁰

Industries : There are 239 registered small industrial units in the region employing 3,544 persons; about 46% of them are agro-based and 31% forest-based, while the rest comprise mineral-based and other miscellaneous units. Agricultural raw materials i.e., rice, oilseeds and maize form the main base for the existing agro-industrial establishments. There are about 150 rice mills mostly located in Jeypore, Nowrangpur, Jagdalpur, and Junagarh towns, the large size mills lying near the railway stations. Rice dehushing in Dandakaranya is not considered as an industry. Most families usually dehush their own requirements of rice, though some paddy is milled by the rice mills and a number of small hullers scattered in the region. Many of the small scale industries combine the work of dehushing paddy with par-boiling. Par-boiled rice is an export item. There are hardly 20 oil presses (*Ghanies*) of standard size, engaging about 2% of rural workers. In the factory sector a peculiar variety of oilseed known as *niger* is most commonly crushed. *Niger* oil is odourless and is used extensively by the local tribal population as the cooking medium. *Mahua* and mustard seeds are also crushed in small quantities, mainly in Bastar district, and the oil is mostly exported. Oilcakes are not used as cattle-feed and are exported to the port towns. A few *dal* mills function on small scale for local consumption. The preparation of jaggery from the sugarcane is also very limited.

In spite of a large cattle population (over 2 million heads), the livestock-based industries have developed but little. Bastar, the district with largest number of cattle, has provided employment to about 10% of the industrial workers in leather works. A cooperative society of 10 members is also engaged in leather work in Bastar. In Kalahandi, there is only one tanning factory employing 10 persons. In Koraput, four village

leather co-operatives of 85 members are at present functioning. The making of *dbols* (beating drums) is widely prevalent leather work among the *Adivasis*. The bone-meal manufacturing and bee-keeping and sericulture have good potential but at present they are in an infant stage, employing about 300 workers, all in Bastar district.

The major forest products of the region comprise timber, firewood and bamboo, while the minor items are *wahna*-gum, tendu leaves etc., Saw milling, lac, harra and *bidi* making are the main forest-based industries. Railway sleepers are the most important product of the saw mills which are mostly confined to Jeypore, Jagdalpur and Rupra road. Most of the small scale industries are near the rail-heads and majority of sawn timber is sent out by rail. A few carpentry units, making constructional timber, door frames etc., are distributed in Kalahandi and Bastar, especially in Jagdalpur town. There are 656 workers engaged in 67 saw mills and carpentry units. The market for processed wood is mostly local. Although the sawing and furniture works have considerably expanded especially after the D.D.A. and the Dandakaranya-Bolangir-Kozilum (D.B.K.) Railway project, yet the character of exports from the region has remained almost unchanged.

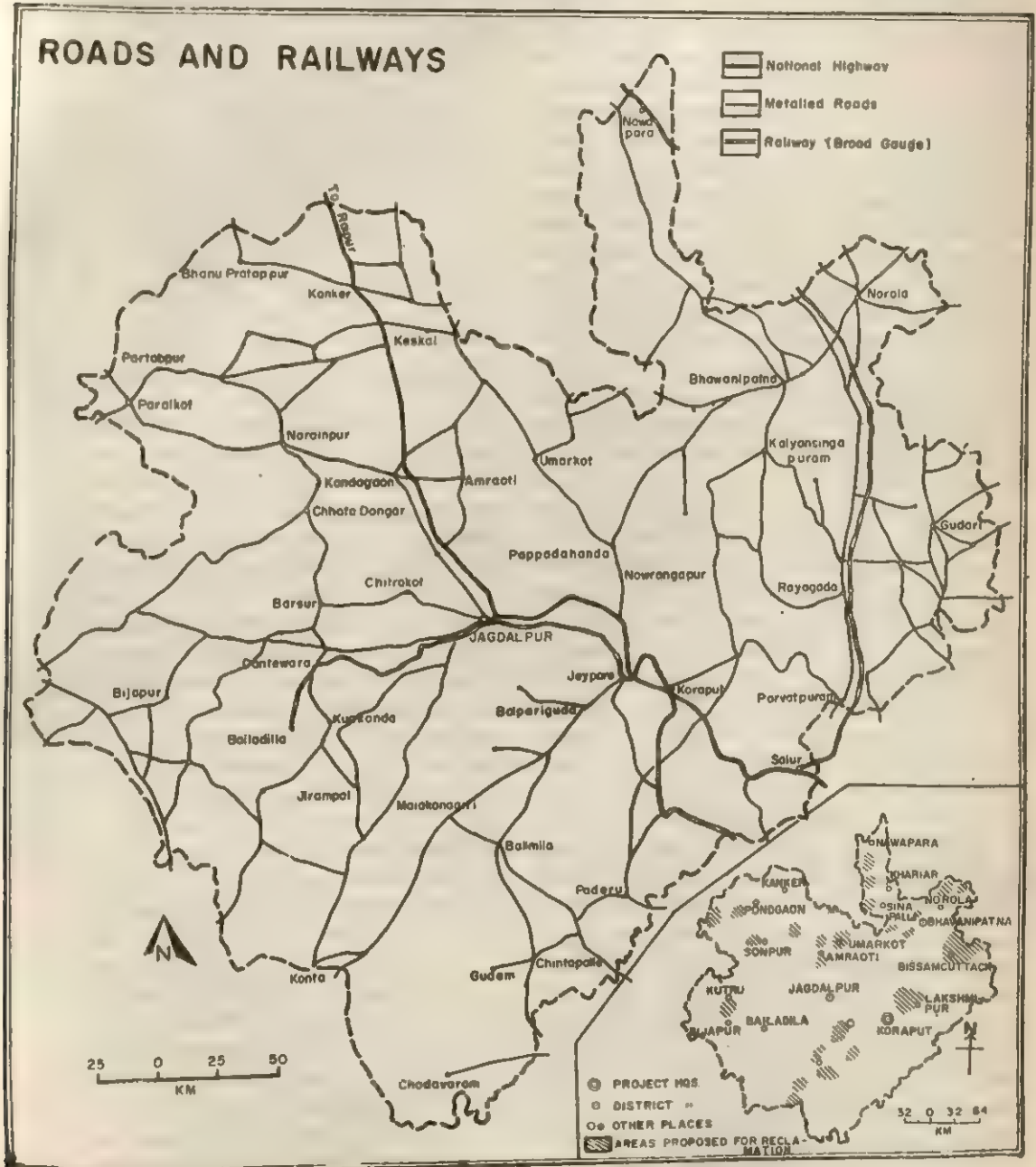
The D.D.A. has recently established three wood work centres at Jagdalpur, Boregaon and Umerkote which not only carry on timber work for housing and office buildings, but also impart training in wood-craft to the local people and the settlers. An integrated development-oriented plan of wood utilization has also been introduced in which logging as well as timber works are simultaneously carried on in the interior forest region. Such plans promise a good future for these mobile units. Though not adequately exploited, the industries based on bamboo employ about 300 rural workers. The bamboo basket is an asset to a tribal family. There is need for establishing a few cane and bamboo work training centres in the rural areas. A large quantity of myrobalan (92,000 quintals) is taken out of Dandakaranya forests mainly from Koraput and Bastar and this engages about 600 workers. Only about 15% of *Harra* is processed in the area and

the rest is exported. *Bidi* making employs more than 500 persons, mainly in Bastar district.²⁰

Transport and Communications

The region, due to its remoteness, economic

backwardness, and physical barriers, has since long remained isolated and inaccessible. Since Independence and more particularly after the establishment of the D.D.A., the region has bene-



fitted much; not only the existing roads have been improved but several new ones also have been constructed. The D.D.A. has completed 413 km of main roads, 550 km of link roads and 344 km of tribal roads while 472 km, 736 km and 248 km of such roads respectively are in hand. These serve the Rehabilitation areas and interlink the administrative, service and marketing centres. In addition, 173 bridges and culverts have been built by now. Two turbulent rivers, the Kotri and the Khaudi in Paralkote zone have been bridged recently which have connected this interior area with the major arteries throughout the year. One bridge over the Potteru in the Malkangiri zone has opened up its inaccessible area. The existing railway which connects Raipur with the part of Visakhapatnam, hardly serves the Dandakaranya. Recently in 1966, a new railway line was laid under the Dandakaranya, Bolangir-Kozilum Railway Project, which links Visakhapatnam (Andhra Pradesh) with Bailadilla iron ore deposits (22.10).

The Abujmar hills, with frequent steep gradients and ranging in elevation between 150 m to 330 m, are very difficult from engineering viewpoint and therefore form the largest inaccessible region for vehicles in the Bastar district. Improved transport and communication links tend to overcome the old barriers and thus have removed to an appreciable extent the age-old isolation of the Dandakaranya. The process of economic development is also accelerated though much still remains to be done.

The Regions

The Dandakaranya, shows an undulating topography with well-marked elevations, depressions, forest-clad hillocks as well as highly dissected plateaus mostly formed of gneisses, charnockites and khondalites of Cuddapah origin, and boldly represents the uplands of Peninsular India. Lying in between the Chhattisgarh Basin in the north and the Godavari plains in the south and mostly inhabited by tribal population, the Dandakaranya exposes a unique personality quite different from other regions with regard to physical, socio-economic and cultural characteristics. One can even today visualize the olden days by looking into



Fig. 22.11

the way of life of the *Adwasis* of the Dandakaranya though being rapidly brought out in the national mainstream by the D.D.A. This is almost a virgin resource region of the country. Based on sub-regional and local disparities, the region is divided into 2 first order, 6 second order and 12 third order regions (Fig. 22.11). The second order regions have been divided on the basis of their physical and broad cultural elements. Further, the third order regions are based on the locally important phenomena, such as catchment of subsequent streams, relative relief, and socio-economic singularities like population density, settlement pattern and agricultural activities or urban-industrial development etc.

The Regional Scheme

47. Dandakaranya Ghats

- (a) Dandakaranya Ghats East :
 - (i) Parvatipuram-Salur Foot-hill Tract
 - (ii) Upper Vamshdhara-Nagawati Basin.
- (b) Dandakaranya Ghats Central :
 - (i) Kalahandi Plateau
 - (ii) Koraput Upland.
- (c) Dandakaranya Ghats West

48. Dandakaranya Uplands

- (d) Tel-Jonk Valley Region
 - (i) Tel-Ret Plain
 - (ii) Jonk-Udanti Plain

- (e) Bastar Upland
 - (i) Kanker-Kotri Basin
 - (ii) Bastar Plateau
 - (iii) Middle Indravati Basin
 - (iv) Bailadilla-Jagdalpur Plateau
- (f) Indravati-Sabari Plain
 - (i) Lower Indravati Plain
 - (ii) Sabari-Sileru Plain.

Dandakaranya Ghats

Dandakaranya Ghats forming part of the Eastern Ghats face the Andhra coast on the south and descend into the valley plains and uplands towards north. The region has been further sub-divided into three second order regions : *Dandakaranya Ghats East*, *Dandakaranya Ghats Central* and *Dandakaranya Ghats West*. The *Dandakaranya Ghats East* are dissected by the upper tributaries of the Nagawati and the Vamsdhara. The region can be divided into two third order units : (i) Parvatipuram-Salur Foothill Tract facing east, which is relatively more populated than the hilly and forested, (ii) Upper Vamsdhara-Nagawati Region with Rayagada as the chief centre. The *Dandakaranya Ghats Central* is the core of the Ghats region drained by the headwaters of the Indravati, Sileru and Vamsdhara. It can be divided into two third order regions, e.g., (i) the Kalahandi plateau and the (ii) Koraput Upland, the former being more rugged than the latter. In the Koraput region, Jeypore is the chief town while Koraput, though much smaller in size, is the district headquarters. Machkund irrigation project has given much stimulus to the growth of Machkund town. Kalyan-Singhpuram and Kashipur are the chief rural service centres. The *Dandakaranya Ghats West* is highly dissected, rugged and least populated region; the ruggedness increases towards the upper portion.

Dandakaranya Uplands

Dandakaranya Uplands, exhibiting plateau topography in the centre (Bastar uplands), descend towards north into Kanker-Kotri Plain and Tel-Jonk Valley Region and towards the south into the Indravati-Sabari Plain. The Indravati cuts almost through the heart of the Bastar Plateau. The region has been divided into three second

order units : *Bastar Uplands*, covering about three-fourth area of the Dandakaranya Uplands, the *Tel-Jonk Valley* in the north-east and the *Indravati-Sabari Plains* in the south.

Tel Valley in the north-east (Kalahandi district) has been divided into two third order regions, i.e., (i) *Tel-Ret Plain* in the east and (ii) *Jonk-Udanti Plain* in the west, based on the drainage characteristics and water-divides. Bhawanipatnam (14,300) is an important service centre in the region. The Indravati-Sabari Plain is also divided into two third order units : (i) *Lower Indravati Plain* in the south-west, and (ii) *Sabari-Sileru Plain* in the south-east taking into consideration their catchment area. Bhopalpatnam in the lower Indravati valley is an important route and service centre. The population is highly scattered. The Sileru is a major tributary of the Sabari and both these streams enclose a valley quite distinct from the eastern portion. Konta near the confluence of the two has developed as a route and service centre. The settlements mainly cling to the river valleys.

Bastar Upland is the heart of the Dandakaranya region with Jagdalpur on the Indravati as its regional centre. This is the culture region of the Hill Marias so devoted to the princely line of Bastar. The uplands are mostly used for shifting cultivation by the tribals. The region can be divided into four third order units. The Kanker-Kotri Basin is the agriculturally most important unit, and Kanker is the chief service centre. Bastar Plateau proper is separated by the Middle Indravati Basin from the Bailadilla-Jagdalpur plateau. Bailadilla has now been developed into an iron-ore mining centre. The region is opened now through modern routeways, though not adequately.

Problems and Prospects

Dandakaranya as the name itself suggests has been an isolated region cut off from the mainstream of movement for ages. In the past also, this region was a region of refuge and exile and all through it has remained a nursery for tribal culture; at present the displaced persons from East Pakistan are being settled, while efforts are

being made to bring the tribals in the mainstream of national life and development process. With vast mineral and industrial potentials, it has now invited the attention of several Central and State Government agencies. Consequently, during the last decade, a concerted attack on the backwardness of Dandakaranya has been made with two-fold objectives, e.g., (i) the effective and expeditious rehabilitation of the displaced persons from East Pakistan, and (ii) an integrated development of this area with particular regard to the promotion of the tribal people. Five among the most important government agencies working for the development of Dandakaranya are worth mentioning. 1. Dandakaranya Development Authority (DDA), set-up in 1958 by the Union Ministry of Rehabilitation, has started its work in four zones of which two (Paralkote and Kondagaon) lie in Bastar district (Fig. 22.6A) and other two (Malkangiri, Umarkote and Rayghar) in Koraput. The D.D.A. has, during the last 8 years, reclaimed over 48 thousand hectares of land out of scrub forest (Fig. 22.10 Inset) and established over 200 villages, 16 hospitals, 10 primary health centres and dispensaries; it has also undertaken the construction of 4 dams and over 400 masonry wells, excavated more than 150 village tanks and set up more than 100 schools and industrial training centres. 2. The Development of Bailadilla-Kottavalasa Railway

Project has added over 350 km of new railway lines to the area. 3. The National Mineral Development Corporation (N.M.D.C.) is engaged in conservation, mining and utilization of Bailadilla iron-ores. 4. Hindustan Aeronautics Ltd., has recently set up Aero-Engine Factory at Sunabeda and 5. The State Governments of Madhya Pradesh and Orissa have set up special agencies for the improvements of the tribal people.

The main lines of development in the Dandakaranya is likely to be in the fields of processing industries, primarily based on locally available agricultural, forest, livestock, power and mineral resources. The rich iron-ore of Bailadilla alone would justify the setting up of a steel plant. The abundance of limestone may form a base for the development of cement industry. Forest resources too would enable the setting up of paper pulp, hard board and plywood industries (22.4 Inset). Moreover, there is vast scope for the establishment of small scale consumer goods industries. The NMDC has recently started the exploitation of Bailadilla iron ores for export purposes. Site surveys for the establishment of cement and paper plants are also in process. New power lines are being laid. Feasibility investigations are also being conducted by the railway authorities to adjudge the suitable sites for the expansion of new rail linkages in the Dandakaranya region.

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'Karnataka' from Karnad ('Kar' in Kannada = 'black', 'Nadu' = 'country' or 'region') means 'the land of black soil'. As a matter of fact, the whole of Southern Deccan (including a considerable portion of the present Tamilnadu) in ancient times was called Karnataka or Karnad, and thus the language and the people were called Kannada and Kannadigas respectively. The Karnataka Plateau forms a major part of the Mysore State and parts of Cannanore and Kozhikode districts of Kerala. Mysore is the official name after its former capital, more correctly spelled as 'Maisur', a corrupt form of Mahisur. Its eastern, northern and southern limits correspond with the State boundary while in the west the 150 m contour roughly separates it from the West Coast. The region (11°36'-18°26' N and 74°35'-78°40' E) covers about 183,340 km². With the formation of Andhra Pradesh, the new district of Bellary, the Kannada-speaking area, was transferred from Madras to Mysore. The Reorganization of States involved the transfer of Bidar, Gulbarga and major part of Raichur from the former Hyderabad State and of Bijapur, Belgaum, Dharwar and North Kanara from Bombay to this State.

Historical Background

Karnataka is one of the early settled regions of India; several relics of an ancient, probably pre-historic civilization, consisting of Cromlachs, Kistavaens and Cairns, etc., are traceable. Legendarily, the area is said to be the kingdom of Raja Sagar of Ikshvaku lineage, the grand father of Bhagirath. The name Mysore itself derives from 'Mahisha' or buffalo in Sanskrit reduced in Kannada to 'Maisa' and 'uru' meaning town or country. It commemorates the destruction of the

buffalo-headed minotaur Mahishura by Chamundi, the consort of Siva. Its reference under the epics as a region denotes its territoriality and advanced cultural achievements. Geographically, the new forces of culture later on penetrated the region from the Western Coast. There are references of the impact of Jain culture in the region. Later it came under the suzerainty of Magadh empire under Chandragupta Maurya who, as supported by Jain texts, visited the Karnataka *desh* (country) and ended his life at Sravanabelgola in Mysore with his teacher, Bhadrabahu. Probably only a part of the Karnataka was included in Mauryan empire which was continued even in the time of Ashoka as he had sent his missionaries to *Mahisa-Mandal* (Mysore) and Vanavasi (Banavasi, north-west of Mysore State) which were probably outside his empire.

Later, North Karnataka came under the rule of Satvahana dynasty (the *Andhras*) whose capital was Dhanakataka (Dharnikotta on the Krishna). This dynasty was succeeded in about A.D. 200 by the *Kadambas*¹ in the northwest and the *Pallavas* in the northeast. The former were of indigenous origin from South Thanagundur (Talagunda in Shikarpur taluka) and Banvasi was their capital. The Pallava capital was at Kanchi. The Pallava descendants are still known as the *Nonahs* around Chitradurga. The remaining part of the region was under the rule of two Ganga princes, Dadiga and Madhav belonging to the Ikshvaku line of Kshatriyas who established their kingdom with the help of the Jain priest, Simhanandi. Kuvallala or Kolala (Kolar) was their main city and Nandagiri (Nandadurga) the stronghold. This Gangavadi kingdom whose inhabitants survive as the *Gangadikeras* ruled till the eleventh century whom the Greek and Roman scholars connect with

Gangaridae or the people of Ganga valley who were under Chandragupta. Their capital was later shifted at Talakad. During the period, the northwest part of the region was under the Chalukyas of Badami whose king Pulakesin subdued the adjoining kingdoms of Chola, Kerala, and Kalabhra and captured Kanchi from the Pallavas. In the eighth century, the Rastrakutas, who were of Kannada origin, according to Altekar, and probably descendants of the Rathikas of the Western Deccan, became the dominant regional power. They captured the Ganga kingdom but intermarriages reconciled the two dynasties which jointly invaded the Cholas. Some of the Rashtrakuta kings were important builders and the famous rock-cut temples of Ellora bear eloquent testimony to their genius. "The Rashtrakuta ascendancy in the Deccan from about A.D. 753 to 793 constitutes perhaps the most brilliant chapter in its history. No other ruling dynasty in the Deccan played such a dominant part in the history of India till the rise of the Marathas as an important power in the 18th century".¹ They were famous for their liberal views and gave full freedom to the Muslim settlers for governance of their mosques and religious profession. Later, in A. D. 1004, Rajendra, the famous Chola king, invaded the capital Talakad and ended the Ganga kingdom. The Chalukyas were also great patrons of literature, art, and architecture and the Vaishnava and Jaina rock-cut temples at Badami etc., owe to them. Sanskrit and Kannada literatures flourished to a great extent under their rule.

Chalukya kingdom was replaced in 1155 by the Kalachuris of Kalyana of the Haihaya lineage of Central India. During 1135-1167 the Shaiva Cult revival resulted in the emergence of the Lingayat creed, which is still a popular form of adherence politically dominant in the region. The Kalachuri dynastic power ended in 1183. This period saw internecine struggles among the Hoysalas and Yadavas on the one hand with the Kakatiyas of Warangal and others on the other, which weakened the power of the Hindu kings of Deccan and paved the way for Muslim invasions. Hoysalas (*Poyralas*) of Sasikapura (modern Angadi) rose to power with their capital at Dorasamudra

(Halebid) in Hassan district. About A. D. 1116, Hoysala King Vishnuvardhan took Talakad from the Cholas. In 1254 this kingdom was partitioned into two, one of Kannada and the other of Tamil but united under Ballala III in 1291. During his time, the Muslims invaded the kingdom under Kafur, the General of Allauddin Khilji. Another invasion completely demolished the capital; thus this dynasty came to an end and the Muslim influence increased and their empire extended to these parts. Though subjected by Muslim invasions partly and at different times, in a very short time conditions improved favourably for the rise of the only Hindu power established during the Muslim period in 1336 at Vijainagar on the Tungabhadra by two brothers, Hakka and Bukka. Hakka took the name of Harihar and their successor expanded the kingdom and they ruled almost over the entire Karnataka north of the Cauvery, but in the north extension of kingdom had been checked by another Muslim dynasty, the Bahmanis, established in 1347. These two were at daggers drawn. After the death of Krishna Raya, the Muslim powers of Golkunda, Bijapur, Ahmednagar and Bidar attacked Vijainagar jointly and shattered the empire in 1565. During the Bahmanis "the army often sucked the country dry and the people were helpless. The wars with the neighbouring States were marked by sickening horrors".² As Taylor accounts, the Bahmani Kings "made few public works, there were no water works, no new roads or bridges and no public inns or ports. Their chief work was huge castles which after 500 years are as perfect as they were built". The few water works were made but to feed the strategic cities and forts. After Vijainagar's collapse, the Wodeyars became powerful and captured Seringapatam (1610), Ummatur (1630), Channapatna and Periyapatna (1644) and became powerful in south Karnataka. In 1684 Moghul army invaded the Mysore and captured the region north of Cauvery. This dynasty was dethroned by his Muslim army chief, Haider Ali whose son Tipu Sultan died in 1799 fighting against the British army. Thus the whole of Mysore came under the control of the British after 1799 and the former Wodeyars were again recog-

nised as the rulers of Mysore under British protection which remained as a princely State up to 1947. The Mysore family did great public works in the economic field as well as in social-cultural systems. This was the first princely State to undertake great water works, rural electrification, and industrial and urban development programmes. The Mysore State comprised Chitradurga (former Chittaldurg), Chikmagalur, Hassan, Mandya, Mysore, Bangalore, Kolar and Tumkur districts. After merger with the Indian Union, it gained the status of Statehood. After the formation of Andhra Pradesh, Kannada-speaking areas were transferred to Mysore; later after Reorganisation of States Mysore became bigger with the inclusion of areas from Nizam territory, Bombay and Madras States, and derived the present shape and size with a marine face.

The Physical Setting

Geology

Structurally the Karnataka region is very complex where rocks from the Archaean to the Recent are found, the Archaean formations occupying about 75% of the total area (Fig. 23.1). Ramarao's classification⁴ of the Archaean complex is in three groups, i. e., Dharwar, gneissic complex and dyke rocks. Gneissic rocks include granite, granodiorites, gneissic granites and banded or composite gneisses.⁵ Charnockites are widespread in Nilgiri area, a part of which protrudes into the Karnataka region in the Biligirirangan Betta and extends even beyond the Cauvery. They are medium to coarse grained, dark coloured basic holocrystalline granitoid gneisses, possessing distinct petrological character with rhombic

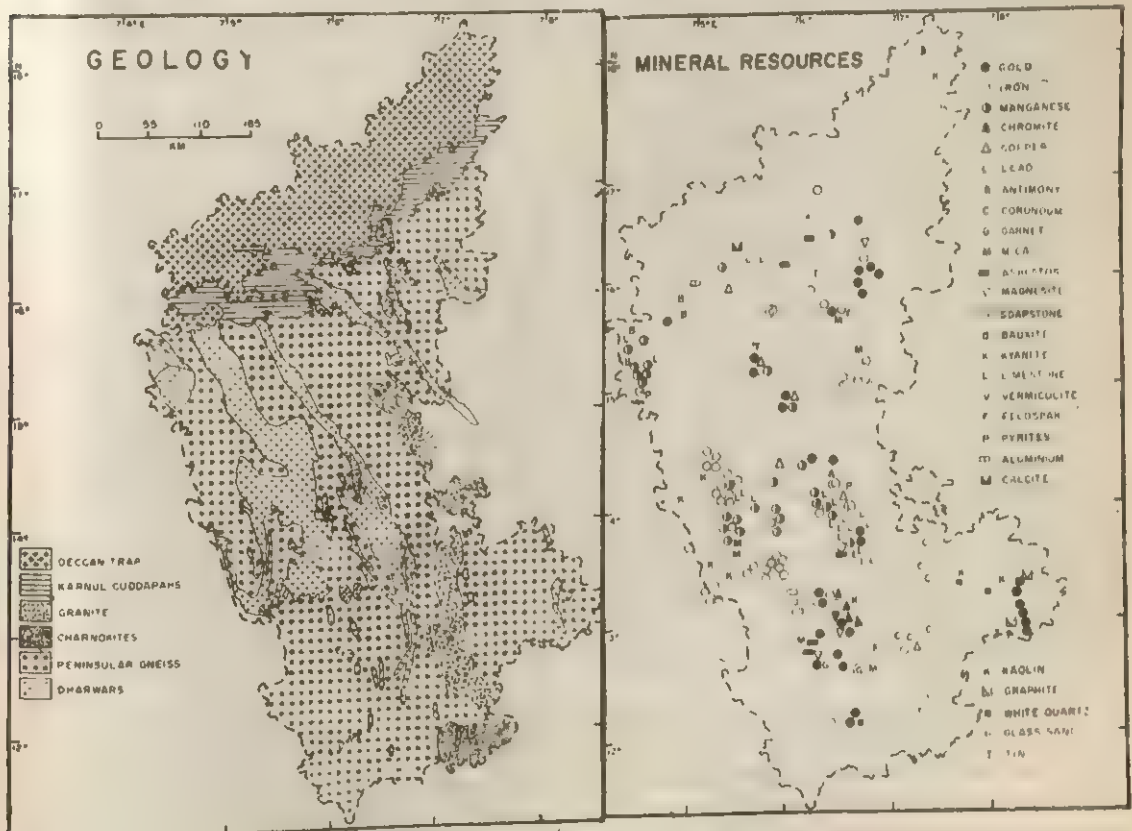


Fig. 23.1

pyroxene hypersthene and a high quality of the dark ferro-magnesium compounds which give it dark colour.⁸ Ordinary mineral constituents are quartz, plagioclase, augite, iron and graphite. These are the source rocks of monazite sands⁷ of Kerala.

Dharwar system is a complex series of crystalline schists mixed with ultra-basic rocks and occur in a series of parallel bands extending north-south. These consist of all kinds of rocks—"plastic sediments, chemically precipitated rocks, volcanic and plutonic rocks all of which generally show an intense degree of metamorphism."⁸ These are highly metallic, containing iron and manganese and sometimes copper, lead and gold. Most of the rocks of this system are formed of phyllite schists and slates. They occur in a number of narrow elongated bands in the districts of Dharwar, Bellary, Shimoga and parts of Chitradurga extending from the Deccan Trap in the north to the Cauvery in the south. Some of them are auriferous such as the quartz veins of the Kolar gold fields. Granites, mainly 'closepet granites' of Archaean age are found in a N—S elongated strip and have escaped differential metamorphism, a characteristic of the other Archaean rocks of Karnataka. Building and ornamental stones are associated with the Archaean formations.

Cuddapah system is found in the form of Kaladgi series and Kurnool series (Lower Vindhyan). Kaladgi series, consisting of quartzite, limestones, shales, conglomerates and breccia⁹, extends between Belgaum and Kaladgi (Bijapur). Upper part of this contains haematite ores of good quality. Upper Kaladgi, known as Bhima series in the valley of Bhima, is composed of quartzite and grit in lower part. In the district of Kurnool (Andhra Pradesh) and Bellary and southeast of Gulbarga, Kurnool series is found unconformably over Cuddapah system in about 360 m thickness. It contains sandstones and bands of diamondiferous rocks in its base.

The close of the Cretaceous witnessed the intermittent eruptions of lavas (Deccan Traps) which obliterated the existing topography, especially in the northeastern part of the region extending in parts of Bidar, Gulbarga and Bijapur districts

where it exists in beds 150 to 1,300 m thick. The most common rock is augite basalt. The variations are distinct only in colour and texture of rocks. The common colour is greyish green tint but black or lighter shades are not uncommon. "The rock is often vesicular and scoriaeous, the amygdaloidal cavities being filled up by numerous secondary minerals like calcite, quartzite and zeolite."¹⁰ The basalts are mainly used as road metal and to a certain extent as building materials. The soils developed are rich in calcium and magnesium carbonates, potash and phosphates and are well known as black cotton soil or 'regur'.

Relief

The average elevation of the region ranges between 600-900 m. It is highly dissected by numerous rivers rising from the Western Ghats. (Fig. 23.2). The general trend of the hills is either from north to south, almost parallel to the Western Ghats or athwart it being the resultant erosional features. The highest peak (1,913 m) is found at Mulangiri in the sickle-shaped hill of Baba Budan in Chikmagalur. Kudaremkh (1,892 m) is next to it. Physically, the Region can be divided into (a) *Malnad*, (b) Northern Upland or Deccan Trap, and (c) Southern Upland, the latter two being popularly known as *Maidan*.

The Malnad in Kannada means 'hilly country' (Male—Hill, Nadu—country). Almost the whole area is traversed by the Western Ghats running from NNW to SSE, about 320 km in length. It has been worn out into a narrow watershed by headward erosion of the Bay and Arabian Sea rivers. In fact, the structural crest no longer acts as a watershed. In the north, the Kalinadi, the Gangawati and the Sharavati have cut through the crest from the Arabian Sea side and also drain part of the eastern flank; in the south, the Bhadra and Hemavati (a tributary of the Cauvery) from the east and the Netravati from the west have narrowed down the crest. Kodachadri (1,343 m) in Shimoga is the peak south of which the peaks are above 900 m. The name 'ghat' is derived from the step-like scarps of the western edge. It is here that it presents a beautiful and unobstructive view of the western skyline above the Arabian

Sea, and the setting sun is an eternal feast for the eyes viewed from the Agumbe Ghats. The eastern slope is comparatively gentler. Baba Budan is an offshoot thrown towards northeast from the main range. It is a sickle-shaped hill facing west, and its southern end is capped by a temple dedicated to Lord Dattatreya.

The surface up to 600 m lies in the northern part where further the 300 m contour roughly delimits the valley flats (flood plains) which at places are 30 to 40 km wide and end in sharp break of slope, often cliff-like on uphill side. The relicts of the older surfaces, rising steeply from the plain sometimes dot the area. At places even projecting spurs are to be marked into the flood plains. The basement here is formed by the Peninsular gneiss and Dharwars which are found in the form of high ridges lying in the synclines as at Siruguppa.¹¹ This pattern is interrupted by the Deccan Trap in the Bhima valley. Generally, red lateritic soils in association with the *regur* predominate in this part. Sands and silts are found only over the flood plain zone.

The 300-600 m height group is observed roughly from the middle Tungabhadra around Tungabhadra dam to the Krishna-Don valley in the north along the border of Maharashtra plateau with some projections of the high patches of W. Ghats, forming water divides between the Tungabhadra and the Krishna and other tributaries. The areal expanse is comparatively greater and the degree of dissection is more.

The southern upland is relatively higher (600-900 m) and more rugged, and consists of a series of rolling plateaus culminating into highly irregular and disjointed granitic hills between Tumkur and Kolar. Others like Narayandurga between Hemavati and Shimsa, Devarayandurga between the Shimsa and the Arkavati, Nandidurga between the Arkavati and the Ponnaiyar and Itikaldurga eastward up to Markandeya are the raised grounds (half-exhumed) which have remained as interfluvies after the wearing away of the ridge originally running east-west. The main ridge lies between the Cauvery and the Tungabhadra. Melkote in Mandya district is in a sheltered valley, while Nandi Hills is a summer resort.

Gunmani Betta, Vikramagiri, Biligirirangan Betta, Madamalai Betta ('Betta in' kannada means 'Hill') are some of the prominent features branching from the Eastern Ghats, south of the Cauvery, marking rather the highest peneplains in the Region (over 1,200 m). These are separated from the Nilgiris by Moyar trench, the scarps being more prominent here. The Cauvery has carved out mostly a narrow valley except between Krishnarajanagar and Srirangapatna.

Drainage

The Western Ghats form the main watershed in the Region between the Bay and Arabian Sea rivers (Fig. 23.2). The control of lithology and structure is quite obvious in the evolution of different drainage systems and patterns. Dendritic pattern is very common, being only locally disturbed by parallel or trellis patterns. In general, there are three main river systems, namely, the Godavari represented by the Manjra, the Krishna and the Cauvery. The Godavari catchment is less extensive and is confined to Bidar district. The latter two systems are divided by an important watershed (central ridge) running east-west, coinciding roughly with 13°N parallel on which Bangalore is situated. The secondary watersheds divide the tributary streams of these systems. Mention may be made of the watersheds between the Bhima and the Krishna, the Krishna and the Tungabhadra, and the Tungabhadra and Vedavati on the north side and the Arkavati and the Ponnaiyar on the south side. The catchment of the Krishna covers about 70% of the area of the Region. The Krishna and the Bhima flow in meandering courses. The former, at places, is braided with islands in between and has a more graded profile. Other important tributaries of the Krishna are the Ghataprabha, the Malprabha and the Banihalla (a tributary of Malprabha). The Tungabhadra in its upper reaches receives water from the Tunga and the Bhadra which unite at Kudali (meaning 'confluence' in Kannada) in Shimoga district. Both rise from the Western Ghats very near to each other, but take different directions till they unite. Bhadravati, the steel town, derives its name from the latter. The Tunga pla...

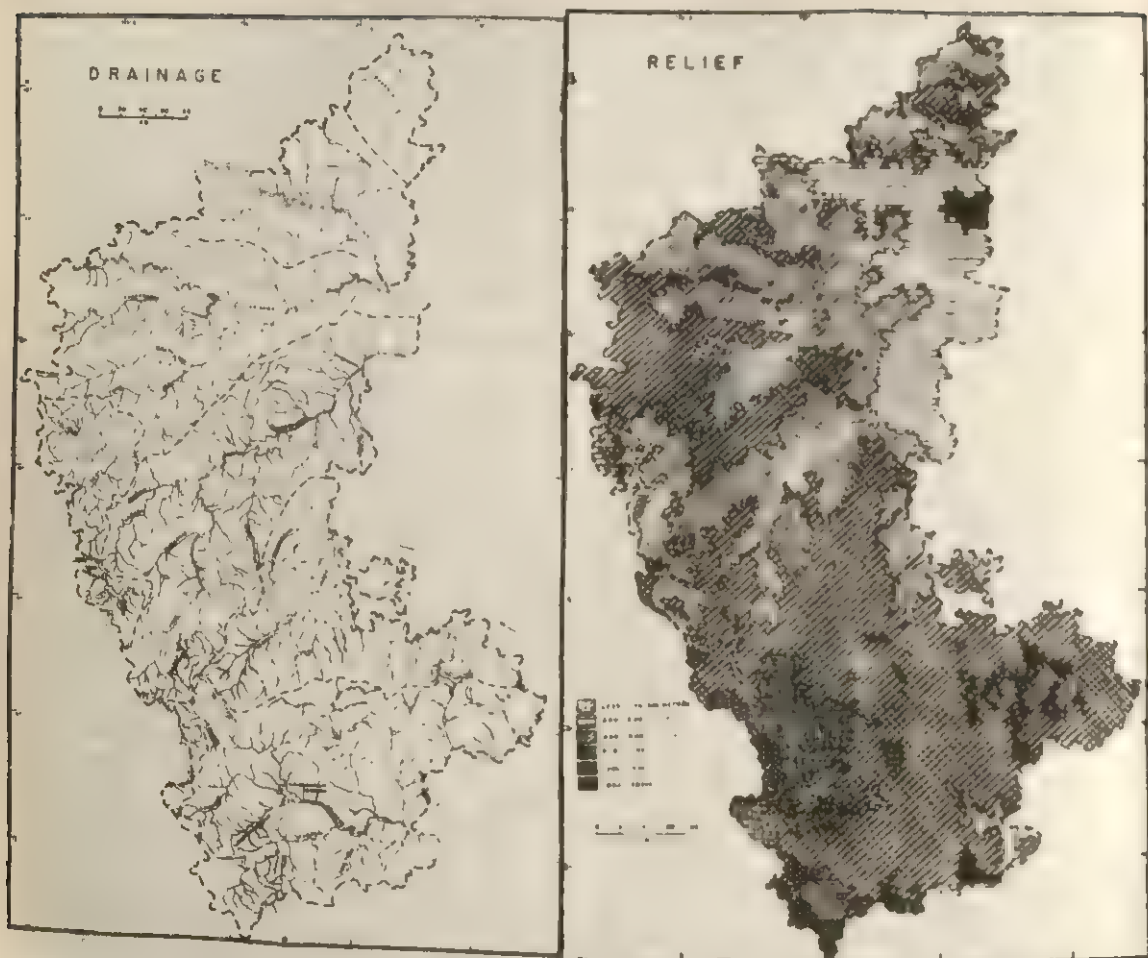


Fig. 23.2

portant role as a locational factor in the origin of towns. It is believed that the Tunga water is perhaps the sweetest of all the river waters, as believed in South India. So, a chain of ancient religious centres like Sringeri, Hariharpur, Tirthahalli and Shimoga have grown along this river. The Bhadra is dammed at Lakkavalli for irrigational purposes while the combined river Tungabhadra is harnessed both for hydro-electricity and irrigational purposes near Hospet in Bellary. Another important tributary of the Tungabhadra is Vedavati, named downstream as Hagari, uniting with the former just below Siruguppa. It is dammed to form a reservoir known as Vanivilas Sagar, between Hosadurga and Hiriyur,

The Cauvery, though irregular in profile, has been the mainstream of the regional culture since long. It rises from a picturesque hill, Brahmagiri at Tala-Cauvery in Coorg, and leaves the region in Kollegal taluk. It has played an important role in the evolution and growth of settlements during historical as well as recent times. Moreover, it furnishes one of the best and oldest power and irrigational facilities in the region through the Krishnarajasagar reservoir and Shivasamudra Power Station. The Shimsa and Arkavati are the two important tributary streams which join it from the north. The former, with its network of Visvesvarayya canal system, provides irrigational facilities for sugarcane in Mandya. In addition,

the Shimsa project supplements the power needs of southern Mysore, Lakshman Tirtha and Kabbini are the two principal tributaries from the south.

Mention may be made of the Sharavati which flows to the west taking its origin in Shimoga district. It forms the highest fall (289.08 m) in India in the name of Jog or Gersoppa falls which is one of the most magnificent in the World. It is both a source of great attraction and the biggest single source of power generation in the country.

Climatic

The region with its north-south elongation and typical arrangement of the major relief features, responds differently to the monsoon currents and thus exhibits sub-regional climatic variations within this tropical monsoonal zone. Western Ghats exert considerable influence as a climatic barrier or rather a divide in the spatial distribution of climatic attributes, the temperature, rainfall and relative humidity etc. In clear accordance with the altitude the Malnad is the rainiest (over 2,000 mm) while the Maidan North with its general lower altitude and rain-shadow location remains the driest (below 700 mm). The South Maidan as a whole with relatively higher altitude has a somewhat equable climate; Bangalore, located on the ridge, exhibits an ideal condition with low range of temperature (7°C) and moderate rainfall (900 mm).

Temperature generally starts rising from February and continues till May. Regionally it remains high in the North Maidan where Gulbarga, Bijapur and Raichur record the maximum temperatures of 42°, 40° and 40°C respectively. The average May temperature varies from 30.4°C in Dharwar to 33°C in Gulbarga. In the South Maidan it remains below 30°C (Bangalore 26.7°C) and so also in the Malnad. Only occasionally the pre-monsoon showers (mango showers) lower the temperatures to some extent. With the outburst of the monsoon sometimes in June the temperatures falls by about 4°C in the north and 2°C in the south and continues to fall till September though gradually. Relatively abrupt decline starts

from November and continues till January which is generally the coldest month. The North Maidan again records higher temperature ranging from 23.9°C (Bidar) to 28.7°C (Gulbarga). In the South Maidan and the Malnad it remains around 20°C. The overall seasonal and monthly distribution exhibits the higher absolute range in the North Maidan (over 20°C), which remains below 10°C in the South and still lower in the Malnad.

The RH in general remains high (above 50%) in the major part of the Region except in the North where it declines to even 30% in March and April. With the sweep of the monsoon currents it starts rising and remains on the average high (around 80%) till September with maximum in July, i.e., 85% or more (Shimoga 90%, and Bangalore 84%). During January and February it swings around 55% in the south-eastern part (Bangalore, Chitradurga) while it is 45% in the North Maidan. Thus spatial distribution by and large corresponds with the altitude.

Average annual precipitation in the Region varies from less than 600 mm in most parts of the North Maidan to over 2,000 mm on the Sahyadri. It justifies the name Malnad (Male = rainy and Nadu = country). Places like Bhagmandala, Agumbe, Sringeri, Koppa, Tirthahalli etc. experience more than 4,000 mm rainfall, while a sharp decline in amount is experienced on the eastern flank where the average precipitation is less than 1,000 mm.

The SW monsoon is the main source of rainfall providing 60% of the total amount. During the monsoon period the alignment of the Sahyadri athwart the monsoon current largely controls the distribution which has wide range from 257 mm (Bellary) to 5,663 mm (Bhagmandala in Coorg). Parts of South Kanara, Chikmagalur Shimoga etc., also record 3,500-4,500 mm rain during this season. The monsoon period is followed by the period of dry spell, Nov.-Feb., when the North Maidan receives somewhat more rain (Bidar 14.7 mm, Gulbarga 12 mm.) than the South (Kolar 10.5 mm), where thick fog or mist is a common feature. April-May marks the second significant period of widespread rainfall which varies between 25-150 mm

in the North and 100-250 mm in the South. The overall variability is more (50%) in the Maidan while it is least in the Mainad region.

Natural Vegetation

The Region is well within the tropics and due to its situation and configuration, receives plenty of rainfall over a large area leading to luxuriant growth of vegetation. Malnad is specially rich in the forest wealth. North Kanara district with 81% of forest cover shares about one-fourth of the total forest area of the Region. About 33.3% of Mysore district is forested sharing 11.3% of the forest cover of the Region; other districts with considerable percentage of forests are Shimoga (29.9) and Coorg (32.3). The tropical evergreen forest cover is denser on western slope of the Western Ghats, receiving heavy rainfall, while on the eastern slopes moist deciduous forests are notable for sal and teak. The dry deciduous forests are found in the South Maidan and scrub forests in North Maidan, which are of little economic significance (Fig. 23.3).

The chief economic product, in addition to teak, sal and eucalyptus, is sandal wood in which Mysore has the monopoly and earns a good foreign ex-

change through sandalwood oil and soap. Uncontrolled cutting for railway sleepers, fuel and plantation farming has led to the rapid depletion of the forest cover, and hill slopes are laid bare. The Government of Mysore has sanctioned a scheme of raising 6,000 acres of eucalyptus plantations annually. It forms an important raw material for paper industry and the decayed tree provides good firewood. Similarly, casuarina is well suited to all types of infertile soils and increases the fertility of soil by supplying nitrogen to it.

Soils

The main soil types (Fig. 23.3) of the region are deep black, medium black, mixed red and black, deep red, medium red and mixed soils. Deep black soil is found mostly in Raichur, Belary, Dharwar and in certain areas of Bijapur and Gulbarga. It has a high content of calcium and potash but is deficient in nitrogen and phosphorus. Cotton and groundnuts grow well in this type. Medium black soil covers most of the remaining portion of the North Maidan except some areas of Dharwar and Bidar. On the low land, they yield good crops and on the high land with thin cover the yield is low. The most ex-

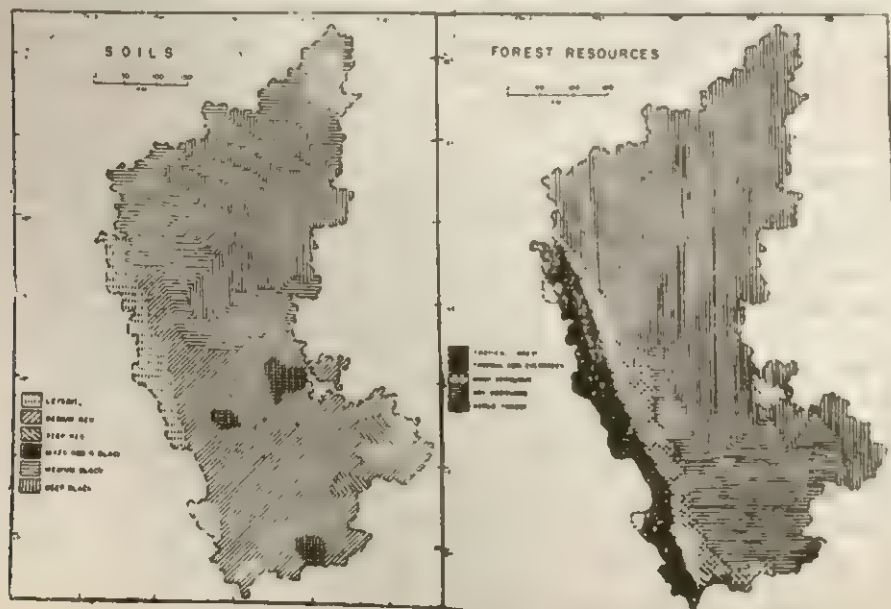


Fig. 23.3

tensive variety is the medium red soil. It covers practically the whole of South Maidan and some portions of Dharwar and North Kanara. It is sandy on high ground and loamy in lower areas; in the tank beds the soil turns to grey. These soils are not very rich in plant food and *ragi* is the chief crop.

There are some isolated patches of mixed black and red soils as in Shimoga and Chitradurga. Deep red soil patches are scattered in Bangalore and Kolar, and are less fertile being suitable for grazing; it is, however, used for market gardening with heavy manuring. Laterite soil caps the Malnad Ridge and is also found in Bidar. These are acidic in nature and have medium nitrogen and poor or low calcium, potassium and phosphorus content. Another type of laterite is found in Belgaum, Coorg and North Kanara districts. It is sandy to sandy loam in texture and less acidic (pH 6.3-7.3). In well-drained areas it responds well to agriculture, particularly the plantation crops like coconut, areca, coffee and pepper. Arecanut and coffee markets are located in Shimoga and Chikmagalur respectively. *Casuarina* has given its name to the Jog or Gersoppa Falls (in Kannada *Ger*=Cashew, *Soppa*=leaves or bush).

Minerals

The minerals are chiefly associated with the Dharwar system (Fig. 23.1). The notable among these are iron, manganese, chromium and gold. The Baba Budan Hills¹² have large reserves of iron ore, mostly haematite. In addition, it is also found in Shimoga district and Sandur (Bellary). Manganese ore occurs in Belgaum, Shimoga, Chitradurga and Tumkur districts. Chrome ore deposits are found in a thin band running for about 32 km from Nuggehalli (Hassan), in a northward direction towards Arsikere. Some prospective deposits are also found in Shindavalli, Talur, Chitradurga and Shimoga areas. Gold is associated with the quartz reefs embedded in the dark hornblendic schist of the Dharwar system, running in a north-south direction, right from the southern border of Kolar district and passing through Bangarapet (Bangar=gold, and pet=market in Kannada) and Kolar Gold Fields.

It is here that the Dharwar system stretches for a length of 64 km attaining a width of about 7 km. Other minerals associated with the Dharwars are pyrites, copper, lead, antimony, bauxite, corundum, garnet, asbestos, magnesite, graphite, limestone, kyanite, sillimanite, soapstone, etc. Hypersthene is found in the Norite Dykes to the south of Kaglipur in Bangalore taluk. Closepet granite is found in a belt from Mandya to Bellary via Closepet, and has been a good source of building stone since ancient times. Gometeswara, 26.43 m high, chiselled out from a single fine-grained boulder of granite in Sravanabelagola in Hassan is a good example of an ancient monument, while Vidhan Soudha and other buildings in Bangalore illustrate the utility of granite during modern times. Dharwar schists were used for ornamental structures in the temples of Halebidu and Belur. Lastly, Biligirirangan Betta may provide much-craved-for monazite, a radioactive mineral.

Physical Resource Base

The rivers, soils, forests and minerals form the chief ingredient of physical resource base of the Region. Though the soil is not fertile everywhere, the irrigation facilities have encouraged wet farming of sugarcane, paddy and market gardening. In the Malnad area plantation crops like arecanut and coffee etc., are possible owing to heavy rainfall and well-drained soil.

The Malnad is particularly rich in forest resources as well and sandalwood is of great economic significance in the region. Gold and iron resources, among several other minerals, have strengthened the economy of the Region since long.

The Cultural Setting

Population

The region has registered a total population of over 23 million (1961) with an average density of 126 persons per km²; over one-fifth of the population is urban. As the region is not homogeneous, the general distribution is very uneven and excepting three notable concentrations around the urban-industrial areas of Bangalore-Kolar, Shi-

moga-Bhadravati and Dharwar-Belgaum, and some other patches, most of the Region is relatively sparsely settled. About 62% of the taluks have a low density (below 100 persons per km²), 51 taluks low medium (101-200), 7 taluks medium (201-300), 2 taluks high (301-400) and only two (Mysore and Bangalore) very high (over 400) density. Sandur (56) in Bellary and Jewargi (57) in Gulbarga in North Maidan, Supa (18), Yellapur (25) and Madgod (41) in N. Kanara and Narsimhrajpur (44) in Chikmagalur in the Malnad exhibit the lowest density (Fig. 23.4). The moist but hilly, forested and rugged topography of Malnad provides limited economic opportunities and has sparse and scattered population. Similarly, the dry areas of the east-central and north-central parts carry low density; however, the density

increases east of the latter dry region owing to higher urban population, and still further on the NE in the Bidar region, which is slightly moister, and where even the rural density increases. The density also increases west of this/north-central dry region mainly owing to greater cotton textile industrial development, but the highest density is met with further north-west in the well irrigated land of intensive agriculture with cotton and tobacco industries and consequent greater urban developments. The Hubli city with its cotton textile industrial concentration attracts a large rural population from the surrounding tracts 'causing lower density' there : for example, the "population decreased from 1901 to 1931 in the Nargund area."¹³ This high density zone of the NW extends south-eastwards to Chitradurga

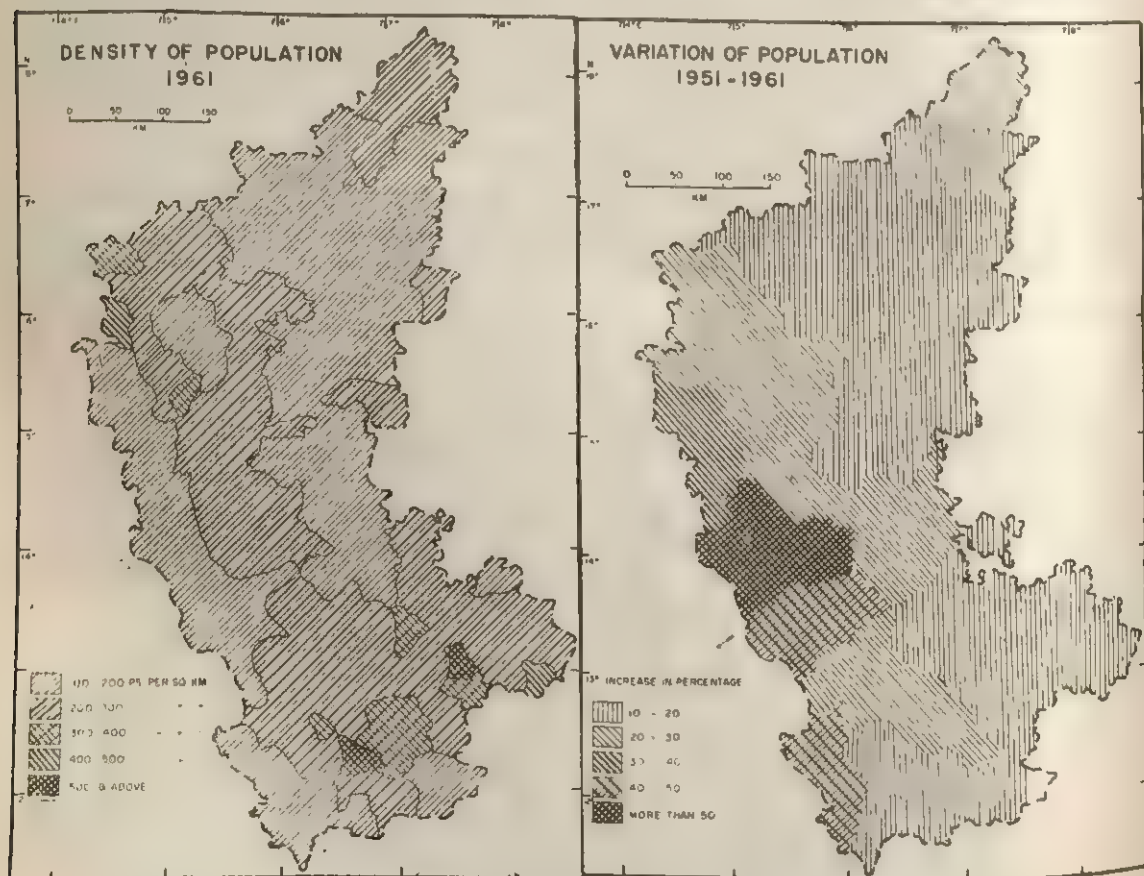


Fig. 23.4

PLATE XIV



Golkunda Fort, Hyderabad



Indian telephone Industries, Bangalore



Nandi, Mysore



Jog Falls, Mysore

through Davangere, a rapidly growing centre. Towards the south there is lower density excepting in the Bhadravati region which enjoys a high medium density owing to its iron and steel and other industrial-commercial developments.

Generally speaking, the south-eastern region carries a much higher density than the north (excluding the north-west and Bidar region) and is mostly rural, though it has some large cities. Bangalore city and surrounding areas exhibit extremely high density, obviously owing to the metropolitan influence, but the notable concentrations in Channapatna area and Narsipur taluk are due to the rural silk filature industry in the former and the adequate irrigation facilities in the latter. There is a belt of medium to high density extending from Bijapur, Chikodi and Athani in the north through Dharwar, Hubli, Shimoga and Bhadravati to Mandya, Mysore, Bangalore and Kolar areas as a whole, supported by agricultural (including cash crops) and/or urban-industrial development. Thus, the South Maidan with favourable climate and topography and consequent over-all agricultural-irrigational and industrial development is more densely settled than the N. Maidan or the Malnad.

Growth Trend : The overall growth of population in the Region (78%) during 1901-61 has been lower than the State (80.7) and the country. The decennial trend was irregular in early decades; while 1901-11 witnessed an increase of 3.5% which decreased to 1.5% in the next (1911-21) owing to the incidence of influenza, etc., as in 1918; from 1921 onwards, however, there has been a continuous upward trend, i.e., 8% (1921-31), 10% (1931-41), 18% (1941-51) culminating in the highest record of over 21% during 1951-61 (Fig. 23.4). In as many as six districts (Bellary, Chikmagalur, Coorg, Dharwar, N. Kanara and Shimoga) there was an actual decrease and below average increase in four districts (Belgaum, Hassan, Mysore and Raichur) during 1901-31; there was, however, a fairly high rate of growth in five districts (Bangalore, 38%, being the highest, and Bidar, Chitradurga, Mandya and Tumkur) during the same period. The growth in 1931-61 has rather been generally much more uniform, though

ranging between 41% (Gulbarga) and 105% (Bangalore).

The rural population has increased much slower (58%) than the urban population (222%) during 1901-61; however, while the highest rural increase (20.6%) was recorded during 1951-61, that of the urban population (61.7%) was witnessed a decade earlier (during 1941-51); this is because a large number of towns have been declassified in 1961. Bangalore district (183%) has shown the highest increase during 1901-61 followed by Chitradurga (114%), accounted for mostly by high urban increases (590% and 255% respectively); urban increase in Shimoga (531%) marked next to Bangalore district. The lowest overall increase has been recorded in Bellary and Raichur (each 51%); Raichur (23%), Belgaum (14.5%), Bidar (10.6%), Bijapur and North Kanara (2.2) districts actually experienced decrease in urban population due to declassification of several centres. Bangalore district recorded a decrease in rural population up to 5.43% during 1951-61 (Fig. 23.4).

In general, the South Maidan exhibits a high population growth with relatively lower variability, though the Bangalore metropolitan and Mysore and Kolar Gold Field city areas have experienced much higher variability because of high immigration, particularly from the dry areas. In the Malnad and semi-Malnad (excepting the southern coffee growing tracts) there has been actual decline in earlier decades, and also low to very high variability depending on such factors as malarial and epidemic incidences (as influenza in 1918) and low economic opportunity causing push migration outside or on the impact of growing economy in some regions; the high growth in Bhadravati region, for example, is related to the impact of iron and steel industry. The North Maidan exhibits medium high to very high growth in the recently developed agricultural and industrial areas (as in Belgaum and Hungund areas with high recent growth of cotton textiles) and Bijapur area with groundnut industry; relatively lower growth is recorded in such areas as Hubli where industries started to grow much earlier and a relative stabilization has occurred.

Urban Population : The Karnataka region with over 22% of population as urban is one of the more urbanized regions of the country. It has over 200 towns of various sizes. There are five of the State's six class I and all the nine class II cities which together account for about 53% of the total urban population of the Region. There are 29 class III towns while small towns are the most numerous (178) sharing about 3.4% of total urban population.

Belgaum, Dharwar-Hubli, Davangere, Bhadravati-Shimoga, Mysore, Bangalore and Kolar Gold Fields form the multiple nuclei of the regional core of urbanism. "The urban-core region is an elongated but discontinuous zone mainly in the western part of the Northern Maidan and the Southern Maidan". There are only four zones of very high urban concentration¹¹ around Bangalore, Mysore, Kolar Gold Fields and Hubli, all of which have also "developed typical semi-urban zones around them, Bangalore having the largest". The nodal position and varied industrial-tertiary economic base of these cities account for a high urban growth around these core areas. Belgaum, though a class I city, has been able to carve out a pattern, presumably because of the pull of Bombay-Poona and the Hubli-Dharwar on the one hand, and several intermediate-size towns, on the other.

The five class I cities are far flung apart and are eccentric in location. The northern and central Malnad and the east-central areas of the S. Maidan are comparatively far from city influence. Davangere city is located near the geometric centre of the Mysore State.

As is natural, the small towns (below 20,000) are the largest in number and are widely distributed. They are more frequent and evenly distributed in the north, and are particularly concentrated in the Nipani-Chikodi area in the north-west. Townships as well as a few large and highly scattered city tracts dominate the S. Maidan. "As a result, rural-urban and inter-urban variations are sharper in the south than the north, an essential difference which must be comprehended in regional planning". The Malnad and east-central part of the South Maidan (lying mostly

between Y. N. Hoskote and Challakere in the north and Sravanabelagola and Magadi in the south) and the Sindgi-Afzalpur tract (over 7,500 km²) are the least urbanized regions. As is obvious, the least urbanized areas are found either in the hilly and largely forested Malnad or the dry famine-frequented tract of the east-central S. Maidan and the Krishna-Bhima middle catchment area.

The *sex ratio* in the region has shown the decreasing trend from decade to decade. It decreased from 983 (1910) to 959 (1961) during the last sixty years, and some of the districts like Bangalore, Bijapur, Dharwar Hassan, Mandya and Mysore have recorded a continuous decadal decrease. Even the remaining districts also recorded the slow downward trend except North Kanara and Coorg where it increased from 925 and 801 (1901) to 946 and 862 (1961) respectively owing to the scope of employment in plantation agriculture of arecanut and coffee.

Occupational Structure : Above 46.7% of the population forms the working force in the Region. The percentage is higher (48.8%) in the rural areas, as compared to that of urban (34.1%). Most of the working population is engaged as cultivators and agricultural labourers (24.2% and 8.1% of the total population respectively) owing to the importance of cash crops and plantation agriculture which itself provide ample scope for economic uplift. These are followed by household industries (3.05%) and manufacturing (1.65%). The percentage of cultivators and agricultural labour are comparatively greater in the northern districts (Bijapur, Dharwar, Gulbarga and Belgaum) than that in southern districts. The percentage of household workers is higher in Bijapur (11.97), Gulbarga (8.6), Dharwar (8.3), and Mysore (8.1) owing to the expansion of textile industries. In manufacturing employment Bangalore district (31.3%) naturally dominates, followed by Dharwar (6.99%), a poor second.

Literacy in rural areas (20%) is poor, and very low indeed for the female population (about 9%). This position is somewhat satisfactory in urban areas where about 45% people (30% females) are literate. Coorg district tops in literacy in both

rural and urban (33.66 and 53.38) followed by North Kanara (30.02 and 49.51). Female literacy in rural areas is the highest in Raichur district (32.26%) and in urban areas in North Kanara (39.50%).

Rural Settlements

Over three-fourths (77.54%) of the population lives in villages, reflecting the significance of rural component in total population as also in general economy and culture of the Region. About half of the total rural population is found in medium size villages (pop. 500-1,999) while 25% in large size (2,000-3,999). Most of the remaining population lives in small villages (below 500). Smaller villages are generally concentrated in the central part of the region. The North Maidan has large-size villages and Belgaum, Bijapur, Bellary, Dharwar and Gulbarga record higher percentage of such villages. South Maidan has a scattering of villages and small size dominates, particularly in the west and south-west. It is, notable that in the districts of the former Mysore State, the number of inhabited villages per 100 km² is more than in the former Bombay, Karnataka or other areas now forming part of the State. There is very wide regional disparity in the percentage of population living in villages of various population sizes : while Hassan (52%), Kolar (50%), Shimoga (35), Bangalore (32) and Tumkur (31) in S. Maidan have high percentage of their population in small villages and low percentages under high medium to large size (1,000-4,999) such as 17% in Hassan; the districts in N. Maidan, i.e., Belgaum (56%), Bellary (40), Dharwar (39), Bijapur (38), etc. exhibit high percentages in large and very large size villages (2,000-9,999). The size of villages appears to be appreciably related to the nature of soil and drinking water facilities among other factors. In the red soil tracts small-size villages are more numerous, while in the Black Cotton soil belt, it is the other way about as in the latter belt "it is more difficult to obtain potable water by sinking well and perennial streams are also scarce", and hence the tendency to form large clusters around the available points in the red soil area, "water would be struck anywhere and

there are more 'perennial streams', and hence a more scattered patterning in smaller settlements.

Regional variations are well-marked in the settlement types as is clear from the study of the size-distribution of villages. In the N. Maidan, villages are generally large, compact and widely spaced. River banks prone to flooding as of the Krishna or intensely eroded banks of smaller streams are avoided, though water-points are the choicest sites and rather fundamental consideration in village origin and development. Field agriculture and tank irrigation play a dominant role in community organization of local life and set the pattern for large compact villages. In Dharwar or Bellary area, or Gulbarga or Raichur Doab, typically large-size compact villages with uniform distribution are remarkable features of the rural landscape. Road side locations also give rise to large compact villages with linear alignment and some tertiary functions alongwith agriculture, and many of these bustle with rural trading activity.

Semi-compact settlements alternated with large compact nucleations are to be observed in the central portion of the Region or in the northern part of South Maidan. The tract between the Cauvery and the Tungabhadra, studded with numerous tanks, exhibits an organic relationship between the tanks and the nucleated settlements. The southern part of South Maidan has generally semi-compact to hamleted pattern. However, in most of the Maidan country, the compact settlements are featured with dependent hamlets. In Malnad area, generally semi-dispersed to scattered hamlets or even homesteads are met with; small hamlets tend to cluster on the ridges, most of them located on the 'Betta' land. Water-points are easily available in South Maidan, owing to which settlements are found in the vicinity of agricultural fields, which provide easy facilities for the operation of agricultural activities. In larger and expansive valleys, there are semi-nucleated settlements, though much smaller in size. Sites are highly scattered, the spacing between settlements being far from uniform depending on topography and soil factor. On the

slopes, hutments are found on the middle of the ridge with arecanut plantations on the higher slopes and paddy fields lower down (figs. 23.5 and 6).

SETTLEMENT PATTERNS

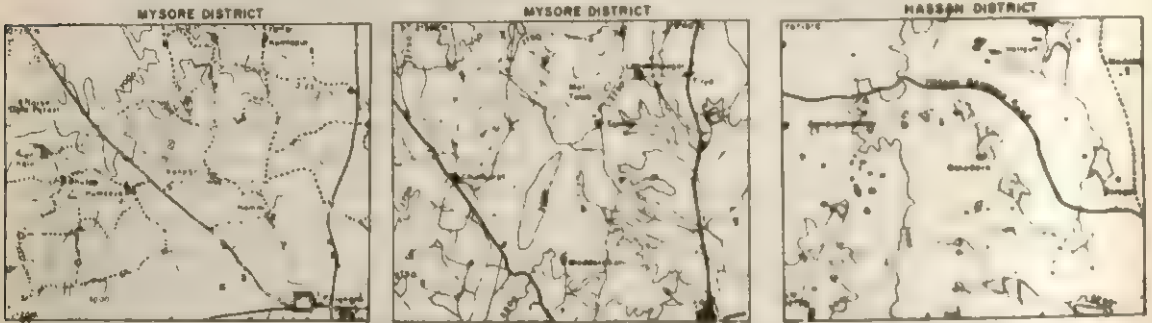


Fig. 23.5

The traditional typical rural dwellings of the masses are mostly thatched and mud or stone-walled, built with a courtyard; houses may have verandahs on the inner side. High walls and tiles characterize the houses of well-to-do country-people, though in modern times there has been appreciable change-over to exotic materials like cement, bricks or slabs for roofing materials. In drier parts of N. Maidan, flat mud roofs are common. In general, everywhere the houses are built up separately. The houses in Malnad are

generally thatch-roofed but in the western part of North Maidan it is mostly tiled and bamboo-cum-mud walled.

Urban Settlements

The region has provided for the emergence of towns in all ages from the legendary and early Hindu to the post-Independence period.¹⁵ Vatapi (Badami), Pampapur (Hampi), Gokaran, Sringeri etc., are very ancient sites. The nuclei of towns in the ancient period used to be the sites associated with sages, or other religious places mostly on the rivers. In the Hindu period various dynasties established their own capital and other strategic strongholds which also developed as centres of trade, art and learning. In medieval period forts and administratively suitable locations played important role in the origin and development of towns. In the modern period trade, commerce, and transportation, alongwith industry, are dominant factors of urban growth. As such, several types of urban centres have developed in the region and represent the various phases of cultural and urban development. Sringeri, Talakad, Halebid and Belur are temple towns. Talakad is a decaying town while the last two are now only of archaeological interest. Sringeri on the Tunga is gaining importance as an educational centre. Seringapatam originated as a temple town but later emerged as fort town in the Muslim period in view of the impregnability of the place surround-

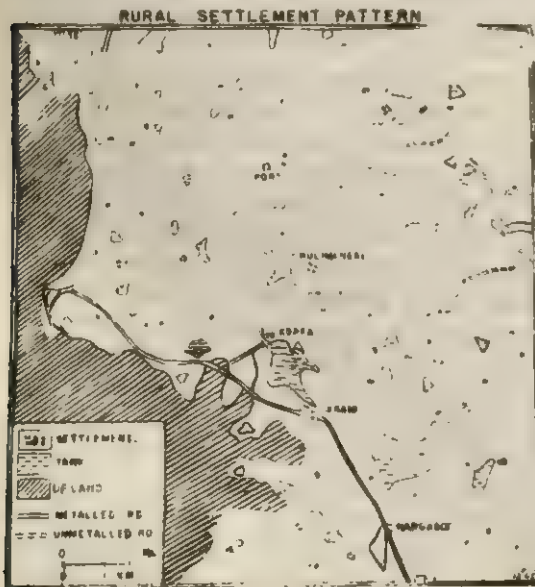


Fig. 23.6

ded by the Cauvery. After Mysore became the capital, it lost its importance. Belgaum, Bijapur, Gulbarga, Kalyani, Jalikot, Devanahalli, Pavagada, Shikaripur, Hosadurga and Hosanagar are all fort towns; the first five were developed in the Maratha period, while the remaining were built or remodelled by Haider Ali. Bangalore also originated as a fort town planned by Kempegowda; since Independence it has become the capital of the State and the largest city of the region with a number of public industrial enterprises like the HAL, ITI, HMT, etc. Tumkur grew as a district headquarters but its growth has been partially eclipsed by Bangalore.

The siting and morphological structure of towns have also been influenced by the nature of terrain and the rivers as by the functional nature of the towns themselves. In religious centres, temples form the nuclei and street alignment and functional arrangement are designed accordingly. Sringeri, Belur, Gokaran etc., are such examples. Bangalore itself has grown as a ridge-head town. Kudachi on the Krishna, Sringeri and Shimoga on the Tunga, Bhadravati on the Bhadra, Seringapatam and Tirumkudalu on the Cauvery are some of the notable examples of the river-side towns. The layout of Tirumkudalu Narsipur is influenced by the Kapila-Cauvery confluence. Aannigeri in Dharwar, Gadag, Lakshmeshwar, Kushtagi and Higgadadevanakote are all sited on resistant spurs of Dharwar schists, gneisses or granites above 600 m. Certain towns have assumed importance on the junction of different terrains or ecological settings: Belgaum and Bijapur on the edge of the Deccan Lavas, or "Dharwar and Hubli on the Arabian Sea/Bay of Bengal watershed" are examples in point; Dharwar and Hubli form now the twin cities, and the latter is developing fast owing to several industries like cotton ginning, pressing and weaving, railway works, and commercial enterprises; Dharwar is administrative and university town. Gadga-Bettegiri is one of the typical collecting centres which have grown amidst agricultural areas growing cash crops like cotton, tobacco, coffee, etc. Kadur, Ramnagaram, Honnali and Athani have developed as nodal points. Nelam-

angala, Bagapalli, Mercara, Gundlupet and Koppa are street towns. Dandeli is a railway terminus being connected by roads with the coastal towns. Londa is the railway junction on Goa-Mysore border. Certain centres have developed due to the proximity of water-points in agricultural areas in which Arsikere, Holalkere, Challakere, etc., can be cited as examples (*kere* in Kannada means huge tanks). Plans for regulated markets have also been designed as in Shimoga; here rectangular blocks are allocated for each function and plans for future expansion have also been articulated. Of all the morphological components, the residential and mixed zones of landuse occupy the largest area in most of the towns. In big centres like Bangalore, Mysore, Dharwar many residential areas exist while in small centres like Talakad or Bagapalli there may be only one residential area and no other function occupies a contiguous and extensive area.¹⁶ In Mandya and Gadag, industrial zones occupy about 8.3% and 4% of total town area whereas Belgaum has a large area under administrative zone (about 14.0%). Bagapalli has devoted 8.3% of area under educational zones which is high as compared to its size. The industrial zone may consist of a single compact area as in Mandya or more than one as in Davanagere with textiles and oil mills and Bangalore with various types of industries with different quantum of space requirements and locational and other facilities. Commercial function and tertiary activities are localized in central areas like the Chowk as in the Bangalore, Athani, etc., while in Chikballapur it is concentrated along the bazar road with its retail and wholesale trading. In small centres with agricultural background like Talakad there may be no clear cut zonation.

Slums are generally found in all urban centres, mostly in the central parts of big towns and outer zones in small towns, like Talakad and Bagapalli. Mixed zones are the characteristics of the old towns with serious house-shortage, dense population, absence of wired or piped amenities, narrow lanes and streets etc., Such mixed zones sometimes are found centrally located as in Gadag and sometimes with peripheral location as in Mandya or Nelamangala and cover from 6% in Talakad to

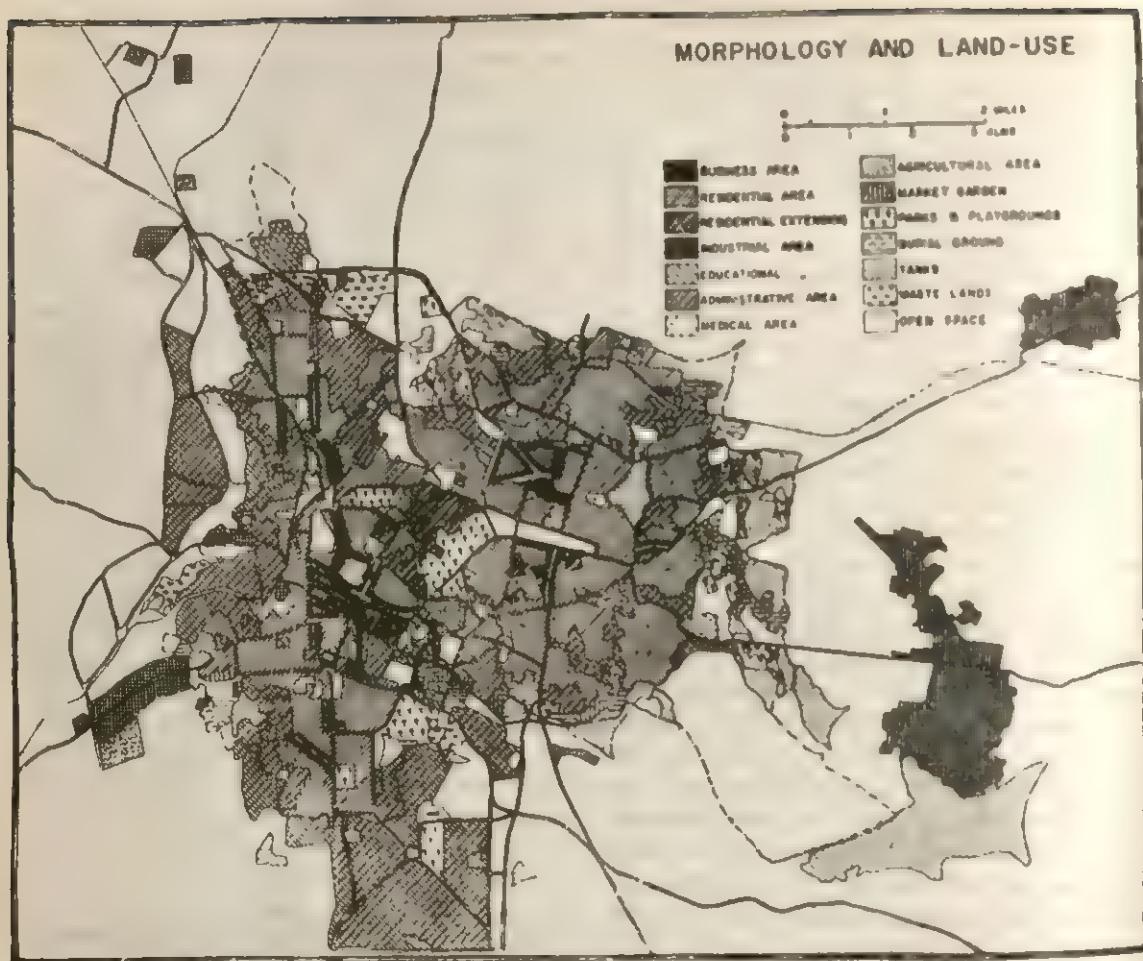


Fig. 23.7 : Bangalore

51% in Chikballapur. Open spaces are either in the form of agricultural lands or parks or those which are specifically for school, colleges and hospitals. "Mysore is a garden city of open spaces", but all the gardens are confined to the eastern and southern sections. Inter-zonal relations are significant in big cities but are lacking in small towns such as Nelamangala, Tumkur etc. which exemplify the inappropriate use and lack of integration between different functional activities.

Bangalore¹⁷ (1,206,961), the sixth largest city of India, has fast grown into a metropolitan centre with its ridge-head location (900 m) and salubrious climate. The *Pettah* is the old, close-settled town originally surrounded by a ditch and a hedge with

a fort on the south. The Civil Lines and the later parts are developed on the high ground formed of granitic dome being surrounded on the NE and E by the large cantonment. Recently the townships associated with the HAL, ITI and HMT have developed within the metropolitan district. A number of well-planned residential neighbourhoods such as Jayanagar, Gandhinagar, Shantinagar, Malleswaram etc., have grown up. About 60% of the city area is residential. The *Pettah* is still the main commercial hub, particularly along the Avenue-road and its cross-roads. The commercial street and the Mahatma Gandhi street in the Cantonment and the Kempe Gowda road in the city are other important business

streets. The wholesale markets are located in the old and new Tharagupet in the city and General Bazar in the Cantonment. Shri Krishnarajendra market is the biggest of its kind in the Pettah for fruits, flowers and vegetables. The well laidout parks such as Lalbagh and Cubbon park form the real lungs of the metropolis (Fig. 23.7).

Sringeri, a sacred town on the Tunga in Malnad, 60 km NW of Chikmagalur, is so named after its association with the sage, Rishya Sringa. The name might have also been derived from the word Simhagiri (lion-frequented hill). Being enchanted by the beautiful natural setting and the serene atmosphere Adi Sankaracharya (God incarnate of lord Shiva) selected this as his headquarters for propounding his creed and established a number of temples and a monastery (Sree Mutt) which became its nucleus. The town is surrounded by hills on three sides (Fig. 23.8).

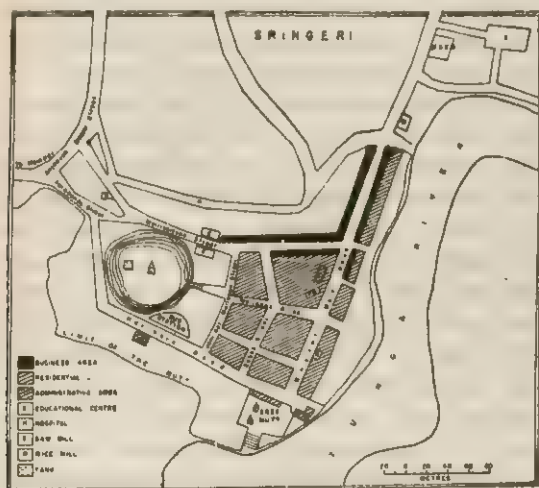


Fig. 23.8

The main street, Bharati Road takes off from the northern gate of the monastery and continues to Shimoga. The important shopping array is spread along this street up to the hospital. Another shopping street is the Mallikarjuna Street which takes off from the former towards west. Bus stand, municipal and taluk offices are on the Harihar Road. The Mallikarjuna Swami temple is on a hill climbed by a flight of about 100 steps, where the only reservoir for drinking water is built for the town. The *Mutt* runs a large Sans-

krit Pathashala where almost free education is imparted. The houses are either of mud, dried bricks or stones with frequent use of wood from the nearby forests. There is usually a varandah-type enclosed platform in the front and a well in a garden at the back. Almost all are one-storeyed and tiled. Many of the house-owners have got arecanut gardens while the paddy fields lie to the north-west of the settlements.

It attracts a large number of visitors from the Mysore state and outside because of its religious sanctity and beautiful scenery. A degree college was established some 10 years ago and is gradually getting momentum and it is planned to raise it to the post-graduate level. It is connected by road with Shimoga, Mangalore, Koppa and Chikmagalur. There is a rice mill at the western end and a saw mill on the bank of the river.

Mysore city (243,865) is the second largest in the State : it has been the former capital and princely seat of administration and grandeur. It is now overshadowed by Bangalore and its growth is less pronounced. Still it marks as an important commercial centre in the region.

Nargund (13,150) : Located in North Maidan is a small town in Dharwar. It was a village some 15 years back but has recently shown considerable development. The main residential areas are perched on the slopes of the hillock, topped by a beautiful temple, dedicated to Lord Venkatesh-wara. It's agricultural character is still obvious. The Malprabha branch provides water for cotton cultivation in the area, and cotton ginning and spinning mills have recently been established here. The relatively dry climate of the area is reflected in its house plan; most of the houses are mud walled with flat roofs (Fig. 23.9).

Economic Landscape

The economic landscape of the region is changing fast and the economy is more dynamic and buoyant than in most regions of the country. Only few years back, the economy was overwhelmingly dominated by agriculture, but now industries including large and heavy ones as well as diverse tertiary activities are changing the structure fast. The Region has not only become self-

sufficient in food production, but also has turned from a power-deficit to surplus region, and is in a position to provide more concessional facilities for the entrepreneurs of the then most other regions.



Fig. 23.9

Land Use : Over 54% of the total land is under cultivation, which is quite significant in view of the fact that the Malnad is forested and hilly and large areas of the Maidan are relatively dry. Cultivable waste (15.3%) and forests (14.5) together cover about one third, while about 1/6th of the land is under 'not available for cultivation' (8.6%) and fallow (7.1) categories. Forests are important in the Malnad while both the cultivable wastes and forests show relatively higher proportion in S. Maidan than N. Maidan, in the extreme south, a rather continuous belt of denser forest cover is found up to the eastern boundary of Kollegal taluk delimiting Malnad and semi-Malnad tracts. Permanent pasture and grazing lands as also culturable land are more extensive in South Maidan and adjoining parts of Malnad. The central, south eastern and northern parts of South Maidan and eastern parts of North Maidan have significant percentage under current fallow, but other fallows are more in the northern part of South Maidan extending westward into Malnad area. In the hilly and forested Malnad, most of the tracts have below 10% under cultivation, and only some portions in the coastal sides and in south-central portion it ranges between 20 to 35%. The North Maidan has the highest per-

centage of cultivated land covering the entire black soil region with flat topography and thick soil, with several taluks having over 80% as arable lands. Among other tracts with high percentage Mysore canal tract and Bangalore city area are significant. In the south-eastern part with larger proportion of bare rocky cover and poor scrub, as also in the far north-east with 'cultivated valleys among lateritic plateaus' arable percentage is low. On district level, Bijapur (84%) ranks first in percentage of cultivated to total land, followed by Gulbarga (80), Dharwar (79.9), Raichur (74.2), Belgaum (69.7) and Bellary (58.8), while the lowest percentage is found in Coorg (21.6) and N. Kanara (11.2) owing to forest dominance.

Irrigation : Excepting the Malnad, much of the region receives insufficient amount of rainfall, and irrigation becomes an essential feature for a prosperous farm economy. The eastern tracts of both North and South Maidan need irrigation water for a stable agriculture. The Five Year plans have provided for tapping surface and ground water resources, yet only one-tenth of the total farm land is irrigated in the Region, partly because Mysore has been handicapped by river water disputes with neighbouring States. The irrigation potential in the State has increased from 7.4 lakh hectares to 10.22 lakh hectares (1956-66), forming 10% of the cultivated area; it was 7.5% few years back. The maximum percentage of irrigated land is found in Shimoga district (41.52%), where about 60% of water is derived from the tanks. Mandya, with its network of Visvesvarayya canal system from the Shimsa has 26.0% of the net sown area under irrigation, and 80% is canal-irrigated, which is the maximum percentage of canal irrigation in the Region. There are several irrigation projects which have benefited different parts. The Tungabhadra Project has already changed the face of Raichur district and parts of Bellary. In fact, Raichur and Mandya are the two IADP Districts in the State and are well ahead in agricultural output. The Upper Krishna Project, costing about Rs. 160 crores, will benefit large parts of Bijapur and Gulbarga. "It is important to plan ayacut development simultaneously with the irrigation

project so that the benefits of the project are not dissipated over 10 or 15 years. Parts of North Maidan, Semi-Malnad and Malnad are under both the major and minor projects. Under small local schemes, bunds are constructed to store monsoonal water as in Bijapur and Gulbarga areas. The schemes in the Ghataprabha and Malprabha will serve large dry tracts of Guledgud, Ilkal, Hungund as also 'the interior agricultural regions of Navalgund, Nargund and Ron talukas'. On the south-west of Mysore, the Kabbin, the Nugu and two other streams, tributaries of the Cauvery, are tapped for irrigation. Lakshmana Tirrba in the south will provide water for the much needed plantation crops, particularly the spice gardens of Coorg. However, Karnataka landscape in many tracts is still dominated by tanks which are extremely important in certain areas, particularly in the area of narrow streams where they can be easily bunded. There are about 37,000 tanks, most of them small. In Bijapur wells are important, irrigating about 25,000 hectares. Hydel power, particularly from the Sharavati Hydro electric Project, is being utilized for energizing pumping sets in villages and during 1967-70 alone over 40,000 pumping sets have been energized, bringing the total of such sets to 115,000 in the State. The State has a plan to energize a minimum of 20,000 pumping sets per annum. However, the major irrigation benefits will accrue from the Cauvery basin development which is under dispute with the neighbouring States. The recent farm revolution has brought the State to self sufficiency in food due to provision of irrigation, fertilizer and other facilities but has created imbalances in regional farm production, marketable surpluses, harvest price dips etc. New farm technology has benefited the irrigated area most, and has sharpened the sub-regional imbalance. The remedy lies in developing sound technology for dry farming since only 40% of the cultivated area is rainfed and 60% lies in dry areas.

The cropping pattern of the region is dominated by cereals which take over 50% of the total crop acreage. Jowar (25%) is the most important crop followed by pulses (12.2), ragi (10.2%), cotton (10.1%) and paddy (9.42). Sugarcane,

condiments and spices, bananas and other fruits and coffee are of local significance and are important for their value than the total acreage. Cereals occupy much higher percentage of the acreage than the State average in the northern Malnad and semi-Malnad tracts which also have significant acreage under sugarcane, fruits (mainly banana) and vegetables.

In the North Maidan also cereals predominate but where cotton and oilseeds (groundnuts) acreage is also high the proportion of cereals to other crops is less than the State average. Pulses are equally significant towards the east. Area under Byadgi is important for condiments and spices (mainly chilies, while tobacco gains significance in Chikodi and Hukeri areas. Tungabhadra canal tract and the north-western well-irrigated tracts are important for sugarcane.

In the South Maidan cereals are followed by pulses. Cotton assumes importance in its northern part, rather an extension of the N. Maidan Cotton belt. Oilseeds are important in the northern as well as central parts, in the latter coconut is also grown. Mandya area is very famous for sugarcane due to irrigation, while tobacco concentration along the north-western border extends into the semi-Malnad region.

Among the cereals, jowar holds the premier crop of the Region and is almost entirely concentrated in the northern half of the State; it is also significant in the four talukas in the extreme south of the South Maidan. Ragi assumes importance as the most important cereal in the south-eastern part, and is replaced towards north by pennisetum. Rice, almost equally important as ragi, has naturally the largest acreage in the western part and the canal-irrigated areas of the south-east and also in the extreme north-west. In fact the main wet region has no cereal other than rice. There is a concentration of jowar in the north and a concentration in the far north and north-west. However, it is less important than ragi or rice in the Region.

Cotton is mainly concentrated in the northern part of the Region in association with the black cotton soil, forming a compact belt focussing on Sindnur-Manvi and encompassing Belary, Siru-

guppa, Raichur. Deodurg, Lingsupur, Muddebihal, Hungud and Gangavati taluks, and merging westwards with another block of high concentration in Yalarga, Ron, Gadag, Navalgund and Kundgol, which is joined by Hubli and Nargund also. Around these are areas of medium and low concentration.

The oilseeds cover about 3 million acres of land, and groundnut is the major oilseed crop, being important in North Maidan and northern part of South Maidan. Coconuts assume importance in Tiptur area of South Maidan, while gingilly thrives in the drier areas in the SW and NE of the Region. Coffee is mainly concentrated in South Maidan and semi-Malnad where cereals are not so important but cardamoms and other spices and condiments as well as citrus fruits are notable. Condiments and spices are important, only next to cereals in the northern Malnad and semi-Malnad where sugarcane and fruits and vegetables are also grown.

Double cropped area with intensive farming lies to the south of Mysore from Piriya putna round to Malavalli 'where there is a marked two-peak rainfall regime and much canal irrigation' and also in Tungabhadra Canal Project tract of which Siruguppa forms the nucleus. Other significant tracts are in Belgaum and Bidar with relatively higher rainfall and in the central Channagiri-Challakere tract with significant well-irrigation. Locally also in patches with major tanks or anicuts or well and pump irrigation in alluvial valleys double-cropping is practised. In the very dry NE and the very wet Malnad, there is little practice of double cropping.

*Hulenhalli*¹⁸ (Pop. 1,100) is a small paddy-growing village (1,170 acres), 12.8 km N.W. of Mandya. The settlement site is limited by two distributary canals in the north and south. Wet lands occupy 43.05% of the sown area of which 73.3% is devoted to paddy and the remaining mostly under sugarcane. Dry fields cover larger area and ragi is the prominent dry crop. The area is fed by canals taken from Shimsa river. In the west 42.7% of the total land is left out for grazing. The settlements enjoy the central site (Fig.23.10).

*Murkani*¹⁹ (1,200 acres, 760 persons) is situated

32 km south-west of Bangalore. Here due to lack of irrigational facilities and poor red soil only dry crops are grown covering about 55% of total land. Ragi covers 86.3% of the cultivated land, sometimes being raised twice a year; it is also generally intercultured with oilseeds and fodder (Fig. 23.11). Lately, mulberry tree and silk-worm rearing have become important occupation. The former grows well in poor soil.

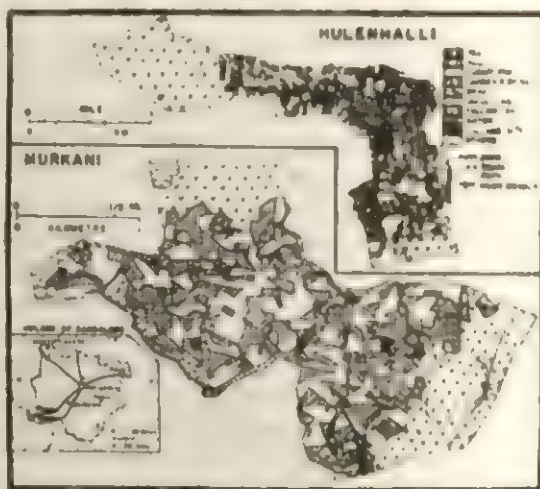


Fig. 23.10

*Hiranahalli*²⁰, a village in Malnad is highly hilly and forested with only 11.9% of the total land as arable. Spice gardens and bananas account for about 60% of the total arable land which reflects the importance of gardens in agricultural landscape in Malnad (Fig. 23.11).

*Dundur*²¹ in North Maidan presents a contrast to the Malnad village. It has about 91% of the total area under cultivation, of which 50% is devoted to non-food crops, mainly cotton and groundnuts. Jowar is the main food crop followed by paddy (Fig.23.12).

Industrial Economy

A study of the early industrial development reveals that Mysore was a pioneer, thanks to the pioneering zeal of the Mysore ruling family, in starting many types of industries, though small in size as compared to modern enterprises. Ever since the early twenties, the State Government has been trying to identify the natural potentialities

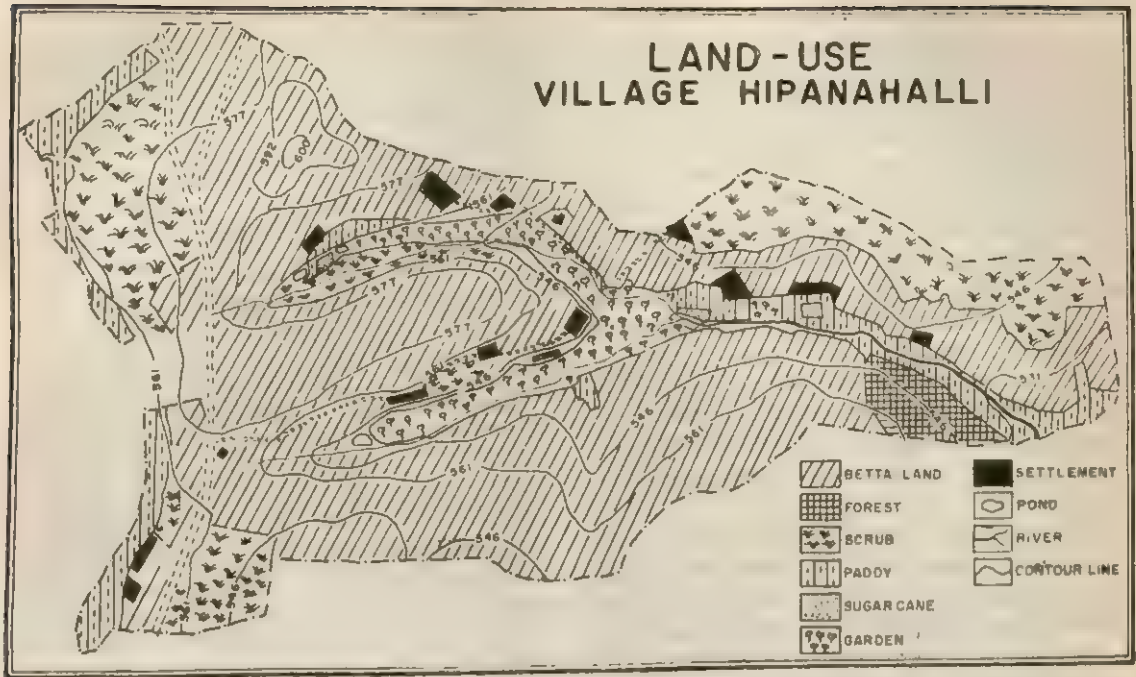


Fig. 23.11

and augment the infrastructures for their economic exploitation; it followed definite programme, even before 1948, of establishing and encouraging the setting up of industries in selected fields. The Re-

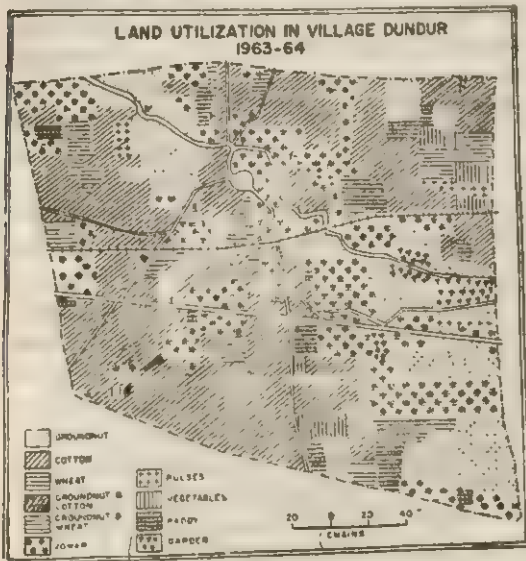


Fig. 23.12

gion was first to facilitate the industrial development by providing adequate power from Shivasamudram (Cauvery falls around the small islands) generating station, which was the first large hydroelectric project in the country as early as 1902. The Cauvery valley was further harnessed in stages to attain the recent capacity of 45,000 KW; since 1927 Shivasamudram has been linked with the Krishnarajasagar barrage (mainly an irrigation project but also to maintain the flow at Shivasamudram). The Shimsha was harnessed to produce about 17,200 KW, and was followed up by the Mahatma Gandhi Hydro-Electric Project at the Gersoppa or Jog Falls where the Sharavati has one of the greatest leaps in India (251 m), with a capacity of 120,000 KW. The Five Year Plans projected for generation of 33,200 KW from the Bhadra, 99,000 KW from the Tungabhadra and 891,000 KW ultimately in stages from the Sharavati Hydro-electric Project, one of the biggest of its kind in the country. The total installed capacity at present is thus 1.2 million KW, i.e., 10% the national total, and with relatively low cost

of production, the State is in a position to offer attractive tariffs to industries.²³ The per capita consumption of electricity in 1956 (64.9 Kwh) went down to record only 37.8 Kwh after the Reorganization of States owing to the merger of undeveloped agricultural districts of the north. In the late 50's and early 60's the Region was power-short, but with the Sharavati Project it is power-surplus and is exporting power to Goa and Tamilnadu. Early electrification in the old Mysore State resulted in its early lead in industrial growth, while the northern cotton-growing areas were mainly exporters of cotton; some cotton was, however consumed in handlooms as evidenced by Bijapur district which has 50,000 handloom workers but only 115 in large scale establishments.

Textile industries with 326 factories are the most important, employing 22.9% of all the workers which is followed by mining (18.9%) food, drink and tobacco industries (17.1), engineering (16.9) processing of wood and stones (6.9), ginning and processing (6.4), chemicals and dyeing (3.4) and paper and printing (2.9). Cotton ginneries are widely scattered in the cotton-region of west Maidan and slightly less in the Arsikere-Chitradurg-Davanagere tank country, mainly in the collecting centres along the railway, like Raichur, Bijapur, Hubli, Gadag, Gokak, Nargund etc.; Hubli, Gokak and also Gulbarga (though away from the cotton tract) have emerged as textile centres. The contact towns on the west from Athani to Ranibenhur are also important ginning centres. In the South Maidan Bangalore, Mysore, and Nanjangud are important centres, mostly on imported raw material, though the latter two lie in a small cotton growing area (Fig. 23.13).

Industries based on other agricultural products are quite scattered in response to local raw materials and probably local consumption. Bangalore and Mysore have important concentration of rice, flour, oil and tobacco units; Mysore has also a large coffee-processing unit. Rice and oil mills are also located in Davangere. Raichur-Gulbarga belt has *dal*, rice and oil units. Yadgir in this belt is a tobacco-processing centre.

Bangalore has emerged industrially the most



Fig. 23.13

developed district in the Region employing as it does 25.4% of the total factory workers. Various big industrial enterprises like HMT, ITI, HAL, Binny Mills etc., are located within the metropolitan district of Bangalore. There are four main industrial belts in the Region : Bangalore-Kolar-Mysore, Dharwar-Hubli, Shimoga-Bhadravati and Bijapur-Belgaum. Bangalore-Mysore belt specializes in heavy industries, engineering works and textiles. Shimoga-Bhadravati is famous for iron-steel works; Mysore Iron and steel Ltd. at Bhadravati started in 1923, is the biggest steel producer in South India, capable also of producing complicated castings. Its new development of special steel (capacity, 77,000 tons) will induce the growth of several engineering industries. This concern also manufactures cement by wet process. Dharwar-Hubli and Bijapur-Belgaum belts are noted for cotton textiles.

Among other notable large industrial centres, Mandya town is the biggest for sugar production, while Uganbhurd and Sankeswar in Belgaum, Munirabad in Raichur, Hospet and Kampili in Bellary, Kambur near Bijapur, and Pandavpur in

Mandya are the other centres for sugar production, while several others are in the offing. Shahabad in Raichur and Bagcpalli in Bijapur are important cement producing centres. Kushalnagar in Coorg is coffee and rice milling centre and Harihar is the biggest railway workshop centre in the Region. Davangere is famous for agricultural implements, coarse blankets and cotton textiles.

Apart from these, some new industries have emerged mostly as a result of cheap and abundant power of the Sharavati Project. A major aluminium project has been set up by the Indian Aluminium Company at Belgaum, destined to consume 200 MW of power and to produce 100,000 tons of aluminium per annum. Likewise, Harihar Polyfibres Complex and the Causitic Soda Complex in North Kanara etc., are also being set up. Bellary-Hospet iron ore area (Fe content 67%) which exports 3 to 4 million tons of ore, may soon have a steel factory.

The State Government has recognised a number of "growth areas" in which large tracts are acquired for industrial development by the Mysore State Industrial Development Area Board. These areas are around Bangalore, Belgaum, Mysore, Nanjangud, Shimoga-Bhadravati, Harihar-Davangere, Hubli-Dharwar, Dandeli and Gulbarga.

Small Scale Industries : Important cottage industries are handloom and mat-weaving, wood carpentry, sandalwood oil extraction, leather goods, palm-*gur* making, tile manufacturing, coir making, etc. Small scale industries are generally more important in the southern half of the region, including Shimoga and Chitradurg, employing about 3.5% of the population. In the northern areas it ranges below 2% except in Bijapur (about 4%) with some important handloom centres. Small scale textile units are located, more or less, along a belt extending from Tumkur to Belgaum. The maximum concentration is in Bijapur district (91.7% of total workers in small scale industries), followed by Dharwar (78), Belgam (63) and Chitradurg (55%). Bangalore is leading centre in silk textiles with over 15% of its small scale workers where Ramnagaram, Channapatna and Magadi are important centres for mulberry production. The Government-owned silk mills are loca-

ted at Kollegal, Mysore and Kanakapura. Chitradurga and Tumkur are famous for woollen textiles with ample scope for sheep-rearing; Davangere and Hiriur in Chitradurga and Amruthur in Tumkur are important centres. North Kanara with coconut plantation is famous for coir-making. Sorab (also for ivory-carving), Sagar, Sirsi etc., are famous for sandalwood and Government sandalwood oil factories are located at Mysore and Shimoga.

Transport

Though the region is criss-crossed by hill ranges with rugged topography, road transport is quite significant here. The extension of railway is on small scale but all the main centres have been linked. All the taluka headquarters have been linked by roads and important regional centres by State and National Highways.

There are a few railroads, and the only broad gauge railway line is Bangalore-Madras branch via Jalarpet. Bangalore has developed as a big railway junction. The old Mysore State had 1200 km of metre gauge railway which links from Chamrajpet to Poona via Mysore. In response to the needs of the economic development the Mangalore-Hassan line is now being constructed to open the hinterland. Only 14 major towns have rail connections; 111 towns are 15 to 40 km from railway stations and the remaining more than 40 km. The east-central part of N. Maidan, the Malnad and eastern parts of the Region have large patches without railways.

The Region has over 48,000 km of roads, over four-fifths being village and district roads sharing almost equal proportions. Most of the remaining are State roads, and only about 1500 km are National Highways. Except some of the area in Chitradurga district, the South Maidan is fairly accessible from road as 75% area is within 8 km. However, some patches infested with longitudinal ridges beyond Bellary and Hospet are inaccessible. Malnad and the dry NE part of North Maidan are comparatively much less accessible.

Bangalore is the only town of the Region on the air map of India with regular flights from Bombay, Delhi and Madras.

The Regions

Karnataka Plateau with its Malnad rim and Maidan character is diversified by the Krishna and Cauvery river systems, rainfall variability resulting in varying patterns of land use and settlements. The vast Maidan, so named after its relatively low and subdued relief, is divided into North and South largely owing to cultural differentiations; the former is mostly drained by the Krishna and the latter by the Cauvery system. These physico-cultural factors coupled with local factors such as patterns of economic and urban developments have helped in distinguishing in all 3 first order, 13 second order and 27 third order regions as follows (Fig. 23.14).

49. Malnad

- a) North Malnad
 - i) Belgaum Region
 - ii) Sirsi Region
- b) Central Malnad
 - i) Shimoga Region or Eastern Flank Region
 - ii) Sringeri Region or the Western Hill Region
- c) South Malnad
 - i) Chikmagalur Region
 - ii) Coorg Region
 - iii) Gundlupet Region

50. North Maidan

- d) Bidar Plateau
 - i) Manjra Valley
 - ii) Kalyan-Chincholi Region
- e) Gulbarga Plain
 - i) Gulbarga Plain North
 - ii) Gulbarga Plain South
- f) Raichur Plain
 - i) Raichur Plain East
 - ii) Raichur Plain West
- g) Bellary Plain
 - i) Bellary Plain North
 - ii) Bellary Plain South
- h) Dharwar Plateau
 - i) Dharwar Plateau East
 - ii) Dharwar Plateau West
- i) Bijapur Region
 - i) Bijapur Region North

ii) Bijapur Region South

51. South Maidan

- j) Chitradurga Region
 - i) Chitradurga Region East
 - ii) Chitradurga Region West
- k) Tumkur Region
 - i) Tumkur Region North
 - ii) Tumkur Region South or Hassan-Mandya Region
- l) Bangalore Region
 - i) Bangalore Region East
 - ii) Bangalore Region West
- m) Mysore Region
 - i) Mysore Region East
 - ii) Mysore Region West.

The Malnad stretches in a continuous belt trending NNW—SSE. Due to the deeply dissected Ghats edge in the west and various curves in the east, the width of this region varies from 40 km to 85 km but its width narrows down near Sakleshpur where the headwaters of two rivers, the Netravati and the Hemavati have cut the Ghats.

The topographical features of the Malnad also vary greatly from north to South. In the northern part around Supa and Dandeli it attains a height of 450 m to 600 m and south of this it descends and is just an upraised part above the general level of the plateau though some ridges attain heights above 600 m. The Malnad South attains a height of 900-1200 m in a large tract, especially along the Western rim just above the coastal plain. Some of the parts of this area attain considerable height as the Baba Budan Hills (1,913m). This part serves as watershed for the two different drainage systems and the rivers have, finely dissected the area giving a picturesque hill-and-valley terrain. In the north the westward swift-flowing rivers have cut deep valleys and the resulting heights make many conical hills.

The present agricultural economy of the Malnad is based on small one-crop terraced paddy field in association with plantation of areca, betel, pepper, cardamom and coffee. Significant porportion of double cropping is found in Northern part (5 to 10% of the net sown area). The sufficient rainfall skilfully utilised, permits intensive cultivation. The better land in northern and central

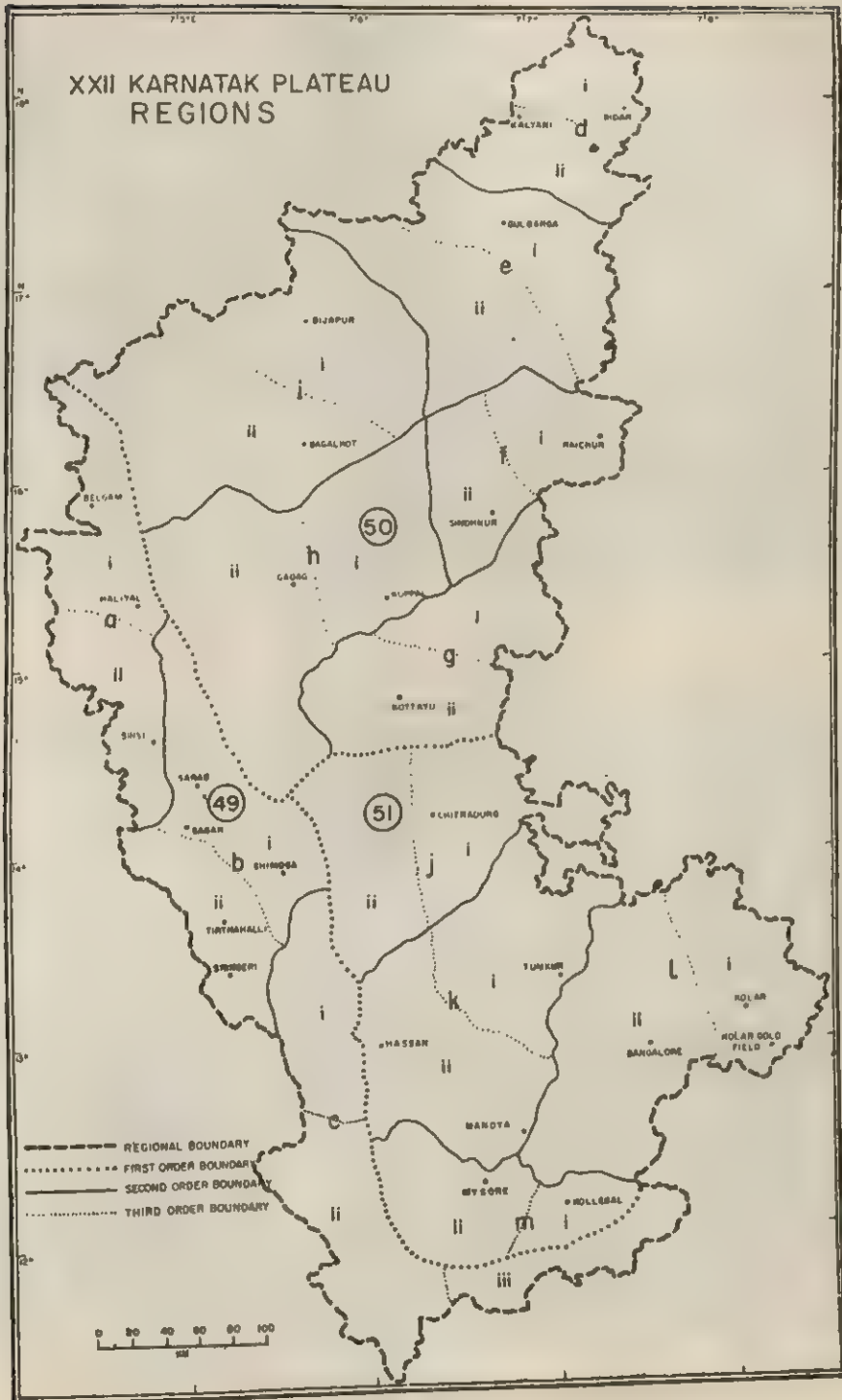


Fig. 23.14

parts gives three crops, areca on higher parts, bananas just below and coffee on the lower slopes. Here there are large coffee estates unlike the northern part. Areca is more dominant in northern region and its acreages are large in the central belt stretching from Sagar to Sringeri while cardamom is dominant amongst spices from Mudigere to Mercara. Bananas are important in the area from Tirthahalli to Yellapur which is replaced by oranges in the eastern margin of Malnad South.

Malnad is characterised by low density (less than 100 persons per km²) almost in all the taluks. The growth of population except in some mining and industrial areas on the eastern border is low. The settlements are scattered in hamleted patterns and urbanism is also hampered by general inaccessibility of the area. Small holdings are the characteristic features in Central and South Malnad whereas large holding, in North Malnad.²³

The Malnad has been divided into three second order regions namely, North Malnad, Central Malnad and South Malnad. *North Malnad* occupies an area of about 11,000 km² covering about two-thirds of North Kanara and some parts of Belgaum and Shampagaon taluks of Belgaum with some portions of Dharwar district. The region is characterised by high mountains, heavy rainfall and dense forest where paddy and spice plantations form the backbone of the economy. The total population of the region is over 1.2 million, i. e. about 35% of the whole Malnad of which about 11% is urban with 10 urban centres. The total number of inhabited villages is 1,381 out of 5,256 in Malnad.

The North Malnad can be further divided into the *Belgaum region* and the *Sirsi region*. The former becomes significant with the Belgaum city (146,790) which represents a good fusion of the Maratha and Kannada cultures. A number of agricultural towns and service centres have developed in the region, particularly on the eastern flanks. The *Sirsi region* is more rural and sparsely populated. The Kalinadi and the Gangawati draining to the Arabian Sea have highly dissected this region. *Sirsi* (21,240) is a fast growing commercial centre of the region.

Central Malnad comprises the major part of

Shimoga district, about western one-third of Dharwar and some parts of Chikmagalur district covering an area of about 17,300 Km² with a population of over 1.1 million. The region is forest-clad having paddy and sugarcane cultivation mainly confined to the patches adjacent to valley floors based on irrigation. Among cash crops areca, cardamom and coconut are notable. About 80% of the population lives in rural areas in 2069 villages. Most of the population is engaged in agriculture, though mining, particularly in the Shimoga area, is also locally important. *Jaggery* and *pottery* are notable rural industries. There are 17 urban centres having 2,54,414 persons; regional centre is Shimoga. Other small centres are Sringeri, Sorab, Tirthahalli etc.

The region can be further subdivided into *Eastern flank region* (Shimoga region) and the *Western Hill region*. The former is characterised by mining and industrial development with Shimoga (63,764) and Bhadravati (65,776) as the chief centres. Sagar (20,414) is a growing commercial centre, while Sorab (4,327) is another service centre.

The Western hill region is more rural and sparsely populated. Tirthahalli (8,510) is the only town of note and Sringeri (3,343), the ancient religious centre, is now very small.

South Malnad stretches over parts of Chikmagalur, Hassan, Coorg and southern Mysore districts of Mysore and a small part of Cannanore and Kozhikode (part of Wynad) of Kerala, occupying an area of about 13,000 Km² with a population of over 1.1 million. Though the economy resembles other regions of Malnad here coffee estates are found in larger number and areca, pepper, oranges and jackfruits are also grown. About 90% of the population resides in 1806 villages, mostly engaged in agriculture including plantations. Three third order regions are distinguishable. The *Chikmagalur region* occupies the northern portion where Chikmagalur (30,253) is the regional centre. Other towns are mostly small rural service centres among which Belur (7,960), Sakleshpur (7,935) and Mudigere (3,723) are notable. The *Coorg region* is distinguished by its historico-political significance and has a relatively larger concent-

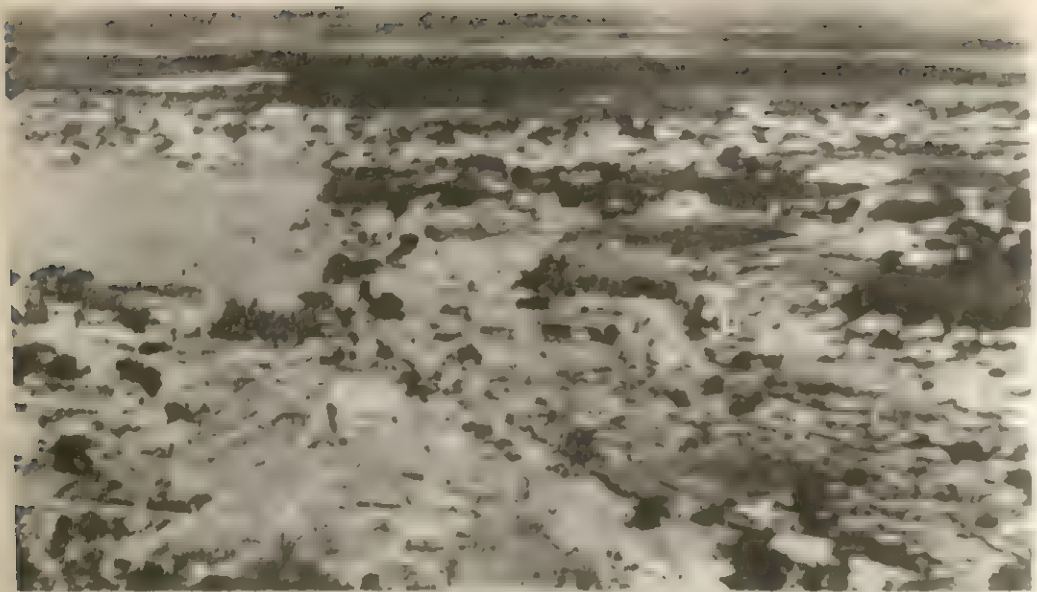
PLATE XV



Meenakshi Temple with Madurai City in the background



The Pagoda of Nellaiyappar Temple and the town spread



A view of Palni Town



A Shandy (Weekly Market) Pollachi

ration or on-agricultural population. Mercara (14,453) is the chief centre. Virarajendrapet (8,138) is another notable centre. The Gundlupet region is mostly hilly and has a very sparse population. Gundlupet (11,732) is the taluk headquarters.

North Maidan is a 'landscape of monotonous, seemingly endless plateau covered with rich black cotton soil, of large open treeless fields...'. It occupies an area of about 45% of the Region and about 38% (over 8.7 million) of the population. The general elevation is about 600 m with broad flat-bottomed valleys, ranging up to 450 m. Southern half of the area lies on Peninsular gneiss with NNW-SSE belts of Dharwar schists. These resistant beds are responsible for steep-sided conical hills in this part which break the monotony of the main plateau. To the north of Dharwar and Peninsular gneisses, sedimentary rocks such as sandstone, limestone and mudstone of Cuddapah formations are found in a continuous line in the west and Kurnool formations in the east. The remaining area is capped with Deccan Trap. "The residual heights above the plateaus here consist of flat-topped ridges, whose sides descend in well-marked steps. Steep black or red cliffs or crags, perhaps in rough pillars because of strong vertical jointing within a thick lava flow alternate with gentler slope on which rock debris has accumulated and immature but not infertile soil has formed."

North Maidan is characterised by black cotton soil. About three-fourths of the northern parts are capped with black soil except some parts around Bidar where laterites are to be observed. The southern portion is covered with red soil in a belt running from Ramadurg to Gangavati and in the extreme south and west of the region.

Irrigation facilities are concentrated in certain areas giving rise to intensive agricultural use in Chikodi-Raybag-Hukeri and Gokak belt, Athani to Jamkhadi along the Krishna, northern Bijapur and Indi-western Sindgi tract. Sulikere Tank Project and Tungabhadra canal Project are important on the western margin.

Jowar is a very common cereal throughout the region which is grown over large area ranging from 17% in Gulbarga to 56% in Indi, and pulses, oilseeds including groundnuts and wheat are also

grown: cotton is dominant except in the northeast. Some fruits and vegetables are also produced in these areas.

Bellary-Hospet area is famous for mineral production. Rich haematite iron ores are found in Sandur taluka having a reserve of about 130 million tons; manganese ore is also found in the form of laterite capping in a belt 36 km long and 3 km wide along a ridge above the plateau. Tungabhadra project provides hydro-electric power. Hospet-Bellary area is likely to develop a steel centre.

All over the cotton growing area small ginning factories are distributed. Some larger units are found at Hubli, Gadag, Bijapur, Nargund etc. Raichur is the centre for ginneries for Tungabhadra cotton area. Large scale textile industries are located only in big centres like Gokak, Hubli, Gadag, Belgaum, Hospet and Gulbarga. Handloom and cottage industries are also found around these centres. Some of the famous handloom centres are Guledgud, Ilkal, Amingad, Hungund, Kamatagi and Rakbari.

Large scale industries based on agricultural produce is also found scattered all over the region in which groundnut, oil or rice mills are important; main centres are Bijapur, Raichur and Bagalkot. Some of the local markets like Badami and Yadgir are also significant for such establishments. Hospet and Munirabad are famous for sugar mills and Nippani, Akol and Yadgir for tobacco factories. Heavy engineering works having printing, metal and large tools and agricultural implement factory are located at Harihar. Bellary specializes for printing and engineering works. Bagalkot, Kaladgi and Shahabad have cement factories. Chemical and soap industry is limited to Bellary. Some leather goods are also manufactured in the western towns. Thus the main industrial areas are along Bangalore-Poona, Raichur-Sholapur, Hubli-Bellary and Gadag-Sholapur railway lines. In addition, a zone between Aland and Hospet and another east of Gulbarga are also notable for large industries.

There are 71 urban centres in the region with a population of 1,671,125. Most of the towns are small service centres with deficient urban amenities. Afzalgarh-Sindgi area is the least urbanised in the region.

The North Maidan has been divided into six second order units mainly based on the economic and servicing areas of the important urban centres. *Bidar* (Plateau 1,863 km², pop. 0.85 million) in the extreme north, covering the Bidar district and some parts of Aland, Gulbarga and Chincholi talukas. Pulses, jowar and sugarcane are important crops. About 93% population is rural living in about 800 villages. *The Majra Valley* in the north is relatively more populated where Bidar (32, 420) is the chief service centre. *Kalyani-Chincholi region* in the south is more rugged and sparsely settled. Kalyani (17,559) and Chincholi (6,047) are small service centres.

Gulbarga Plain (11,375 km², pop. 1.28 million) stretches from south of Bidar region to the Krishna. Jowar, pulses and oilseeds with some cotton are the chief crops. Some industries are found in Gulbarga. About 16% of the population is urban. Most of the villages are compact. The Bhima roughly divides the region into two sub-units: *The North* is greatly influenced by Gulbarga town (97,069). *The south* is mostly rural in character with small service centres like Shorapur (17,689), Shahapur (11,776), etc.

Bijapur Region (18,390 km², pop. 2.36 million) comprises of Bijapur district and some parts of Belgaum. Agriculture is limited only in strips of river valleys with deep fertile soils. Main crops are jowar, bajra, wheat, cotton, oilseeds and pulses with local variation in cropping pattern due to irrigation facilities. The tobacco-growing areas of Chikodi-Hukeri in the south of the Krishna continues upto Gokak, Raibag and Athani. *The Northern region* lying to the north of the Krishna is agriculturally poor and less populated. Here the industrial activities are concentrated in Bijapur (78,854), while in the *Southern region* several towns have various types of industrial activities.

Dharwar Plateau (20,770 km², pop. about 2.6 million) covers major portion of Dharwar district and eastern part of Raichur. It is one of the relatively developed regions. Jowar, wheat, cotton, rice, pulses, oilseeds and spices are the crops grown. Apart from some agro-industries, other small plants have also developed. Among the small scale industries handloom occupies an im-

portant place. It is the most urbanised among the regions of North Maidan with one-third of its population as urban. There are over 2,000 villages, mostly large-sized. The *western sub-region* is relatively more developed and contains most of the important urban centres of the region such as Hubli (171,326), Dharwar (77,163), Gadag-Betgeri (76,614), Ranibennur (31, 304), etc. together with several small centres. In the *Eastern unit* Koppal (19,530) and several smaller centres are found.

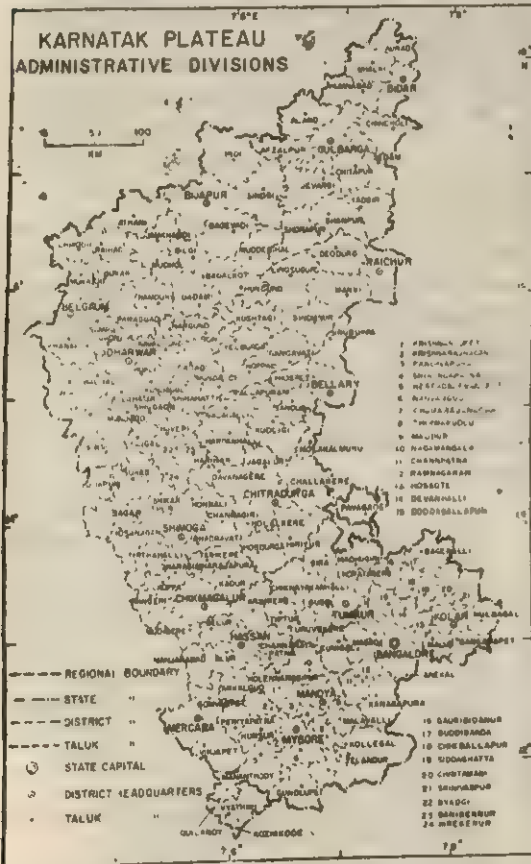
Raichur Plain (8,588 km², pop. 0.86 million) covers Raichur district excluding some western part, and forms the central part of Raichur Doab. This small region has a sound agricultural economic base where cotton occupies about 50% area in each taluk, with jowar, bajra, oilseeds and pulses as other important crops. Various small centres have sprung up for ginning and large centres like Raichur are famous for textiles and chemical industries. However, it is still one of the least urbanised regions. There are about 800 villages, mostly of large size. *The Eastern part* is in the direct service area of Raichur (63,329) and is relatively more developed with Deodurg (8,560) and other service centres. *The Western unit* is served by smaller centres like Mudgal (8,916), Lingasur (9,565), Sindhur (9,455), etc.

Bellary Plain (11,103 km², pop. 1.1 million) covers almost the whole Bellary district and resembles the Raichur plain in economic set-up and cropping patterns. There are 8 towns and 721 villages. The lower Hagari-Tungabhadra Doab or the Bellary Plain North is relatively more developed with the advantage of Tungabhadra Project. Bellary (85,673) is the chief centre with several industries. *The Plain South* is served by Kottur (11,493), Harpanhalli (17,763), etc.

South Maidan (area 57,183 km²; pop. 9.4 million; density 165/km²) symbolizes the old Mysore state which has pioneered in many fields of economic and social activity such as rural electrification, urban and industrial development, and large scale irrigation projects, etc. The region is characterised by ragi, paddy, sugarcane and coconut, the Visvesvaraya canal, predominance of tanks and compact villages with tiled-roof houses amidst irrigated gardens of coconut, areca, pepper and betel vines.

This plateau region is studded with bare granitic boulders and hills extending northward from south of Kollegal through Ramnagaram, Madhugiri and Pavagada. The region has a relatively moderate climate with greater variability of rainfall; the drier parts lie around Chitradurga, in the extreme east near Kolar and around Srirangapatna. The region is very rich in mineral deposits, particularly in iron ore, manganese, gold etc. Shivasamundram and Jog falls are the main sources of hydel power.

The northern part is rather a continuation of the North maidan in agricultural characteristics.



(Fig. 23.15)

Pavagada, northern Kollegal and Gubbi are agriculturally poor. Canal irrigation has led to high incidence of double cropping (upto 25%) in Visvesvarya canal area, Cauvery basin and around Channarayapatna and Nagamangala. Intensive

cropping near Bangalore and other large cities is also common. Ragi is the main crop; it is grown mixed with fodder crop, jowar and pulses in dry lands. Groundnut is produced as cash crop, replaced by tobacco in some areas. Paddy is grown in wetter areas. In irrigated areas sugarcane is an important crop, where ragi is also grown for higher yields. Coconut, areca, pepper, betel vines and limes etc. are also produced in this part. Mulberry is grown from Sidleghatta and Magadi to Kanakpur and Kollegal areas. Bangalore and Mysore with several types of industries lead in industrial development. Mandya, Pandavpur, Naryangund, Sira, Madhugiri, Chitradurga and Davangere are other important industrial centres.

It is the most urbanized part of the Region (45% towns and 25% pop.) Bangalore, Mysore and Kolar Gold Fields (146,811) are class I cities. Rural population is distributed in 13,145 villages which are rather small-sized and dominated by Lingayat farmers.

South Maidan has been divided into Chitradurga, Tumkur, Bangalore and Mysore Regions. *Chitradurga Region* (area 13,973 km²; pop. 1.47 million) comprises roughly Chitradurga district, parts of Chikmagalur and Pavagada taluk of Tumkur. The region is mostly agricultural where jowar, bajra, cotton and oil-seeds are grown. Industrially it is not so developed though Chitradurga and Davangere are important for large industries, notably cotton textiles. About 85% of the population is rural, distributed in 1,727 villages. Its *Eastern region* is drier and agriculturally poorer than the *western* which is irrigated and rich in minerals.

Tumkur Region : (area 17,478 km², pop. 2.56 million) occupies Tumkur except Pavagada; and parts of Hassan and Mandya districts, comprising 27 urban centres and 4,980 villages. Towns are generally of small size; villages are mostly hamleted and closely spaced. The *Northern part* is drier and unirrigated whereas the *Southern part* is canal irrigated; hence the former specializes in ragi, jowar, pulses and oilseeds while the latter is noted for sugarcane, vegetables and paddy. Northern part also lacks in industrial development

with some processing industries concentrated in a few large towns while in the southern part sugar, tobacco and rice mills are important. Main urban centres in the North are Tumkur (47,277), the district headquarters, Gubbi (8,543), Sira (15,408) etc.; in the South, Mandya (33,347) and Hassan (32,172) both district headquarters are notable.

Bangalore Region : (area 17,314 km² ; pop. 4 million) comprises Bangalore and Kolar district and a small portion of Mandya. Agriculturally it is a poor region where ragi and paddy are grown along with sugarcane and potato. This is industrially the most developed region, the main concentrations being at Bangalore and Kolar; the former lying in the *West* and the latter in the *East*. The region as a whole is most urbanised (urban population 40%). The villages are mostly small in size and generally hamleted.

Mysore Region (8,416 km²; pop. 1.37 million) is one of the smallest regions occupying most of the Mysore district. Jowar, ragi, sugarcane, mulberry, some spices and areca are grown. Industrially Mysore itself commands a number of large and small industries. Nanjangud, Hunsur and Kollegal are other important industrial centres. Its *Western* part with Mysore as the regional centre is much more developed than the *Eastern* with Kollegal (22,663) as the main centre.

Problems And Prospects

The Karnataka plateau, though a fairly well-developed part of the Deccan, is confronted with the problems of assimilation of particular areas which have been included within the region due to States Reorganisation Act. Sub-regions like Belgaum and Bidar in the north and Mysore Region East (Kollegal) in the south deserve special attention for integration into the regional development programmes. Within the region Gulbarga, Bijapur and Dharwar etc., suffer from dryness and greater variability of rainfall, and as such their development is associated primarily with irrigation facilities.

The development of transportation, particularly railways, calls for immediate step, linking the northern and western parts of the plateau with the Bangalore and Mysore regions on the one hand and on the other with the Kanara coast. Little attention has also been paid in opening up the rural areas in the northern and western parts though urban centres are developing fast. The Metropolis of Bangalore has exhibited great development with exotic influences being accompanied by serious problems of water supply and slum developments. Actually there is need for arresting such urban growth through a large number of satellites.

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The Andhra Plateau (12° 14' - 19° 54' N and 76° 50' - 81° 50' E), comprising a major part of Andhra Pradesh, covers 204,882 km² incorporating the Telangana (Adilabad, Nizamabad, Karimnagar, Medak, Warangal, Hyderabad, Mahbubnagar, Nalgonda and Khammam districts) and Rayalaseema

region with a maximum north-south length of 810 km and a maximum east-west width of 535 km in the north.

The region as a physical entity forms a part of the extensive Peninsular shield. In the south, west and north, it touches the states of Tamilnadu, Mysore, Maharashtra, Madhya Pradesh and Orissa, while on the eastern side it is delimited by the 100 m contour which is popularly accepted as the lower limit of the plateau.

Historical Background

The history of the region goes back to several millennia before the Christian era when the whole country south of the Vindhyas was inhabited by a dark coloured pre-Dravidian race of low culture¹. In due course of time another race of higher culture gradually moved in from the north and mixed its blood with the earlier inhabitants. From this fusion arose the Dravidians whom their tradition associates with a *panch-dravidam* or five Dravidian regions; Andhra or Telugu, of which the study region forms a major part, is one of them. The earliest mention of the Andhras occurs in *Aitareya Brahmana*² (VII, 92, 18) from which it appears that the present Telangana and its contiguous areas on the north, east and south formed their homeland. A clearer picture of the region emerges from the statement of Pliny who puts on record that some time before the first century A. D., perhaps in the age of Chandragupta Maurya, the Andhra country formed an independent kingdom, its ruler having maintained about 30 fortified towns and a large army.³ Ashoka also puts the Andhras in the list of foreign countries but claims them to have espoused his doctrine.

On the downfall of the Mauryan empire after the death of Ashoka, the neighbouring rulers were



Fig. 24.1

(Kurnool, Anantapur, Cuddapah and Chittoor districts) administrative divisions in full along with the adjoining areas falling to the west of the 100 m contour (Fig. 24.1). It is a land-locked

left free to enlarge their boundaries. Among them was one Simuka, who in the last quarter of the third century B. C. established the powerful *Satavahana* or *Satakarni* dynasty which ruled the Telugu country for nearly five centuries. Under the Satavahanas the boundaries of the Andhra empire spread up to the Arabian Sea engulfing large parts of the present Maharashtra and Madhya Pradesh. The imperialistic policy of the Andhras gave way to conflicts between them and the Sungas of Magadha and king Kharvela of Kalinga during the second century B. C. The Andhras were ultimately victorious in the battles fought between them and Agnimitra, ruling at Vidisa as viceroy of his father Pushyamitra Sunga; the King of Kalinga, however, succeeded in wresting some parts of the Andhra territory.

The Satavahana dynasty was overthrown by the Ikshvakus by the first quarter of the A. D. third century. The Ikshvakus, who are probably referred to in Puranas as the Sriparvatiya Andhras, appear to have ruled from the town of Vijayapuri (Nalgonda district) situated on the Nallamalur Range, the ancient name of which was Sriparvata. Santamula I, the founder of Ikshvaku dynasty, was a staunch follower of the Brahmanical faith and is known to have celebrated not only the *Asvamedha*, but also the *Vajpeya* and some other Vedic sacrifices. This revival of Brahmanism after the fall of the later Satavahanas who probably had Buddhist leanings was, however, short-lived as Santamula's immediate successors leaned again towards Buddhism. The Ikshvakus ruled only over the Krishna-Guntur-Nalgonda region. In the southern part there were some other ruling dynasties like the Pukiyas and Dhanakas in Nellore and Cuddapah areas respectively and with whom the Ikshvakus had matrimonial alliances.

By the end of the A. D. third century the Ikshvaku rule was put to an end by the Pallavas of Kanchi who annexed the area south of the Krishna to their dominion. Contemporaneously the area between the Krishna and the Godavari was constituted into the independent kingdom of Vengi and was ruled by the Salankayans and the Vishnukundins in succession. The Vishnukundins ruled for a fairly long time. They patronised architec-

ture and sculpture. The Pallava yoke was overthrown in Guntur region about the middle of the A. D. 4th century by the Anandas who ruled till the beginning of the 6th century when their territory was annexed by the Vishnukundins.

The beginning of the 7th century witnessed a new era of political rule which lasted for more than four centuries under the Eastern Chalukyas of Vengi. Under the Eastern Chalukyas, too, the lower Godavari and Krishna valleys remained the focus of political interest. In the history of the Telugu country the Eastern Chalukyan era occupies a prominent place not only on account of its long duration, but owing to its achievements as well. In the literary field, the period experienced great progress. Telugu gained importance and with the end of the period appeared the Telugu Mahabharata. The Telugu script branched off from the common Kannada-Telugu script. In short, the Eastern Chalukya period helped in the construction of a basement on which the edifice of Telugu culture was to be built in the years to follow.

From mid-11th to mid-12th century there ruled a Kakatiya family around the Warangal city as feudatories to the Eastern Chalukyas. But when the Chalukya empire showed signs of disintegration the Kakatiyas became independent in the second quarter of the 12th century. In all there were nine rulers in the line, Ganapatideva (1198-1261) and his daughter Rudramba (1261-1296) were the most adventurous and popular rulers who welded the whole of the Telugu speaking country into a single political unit. The huge fort at Warangal still reminds of their valour and achievements.

The sultans of Delhi sent successive expeditions against the Kakatiyas. In A. D. 1322, Ulugh Khan, son of Sultan Ghiyas-ud-din Tughlaq, invaded Warangal and took Prataparudra, the grandson of Rudramba, as prisoner, bringing an end to the other empire of Andhra Desa. The Kakatiya period is rightly considered by the Andhras as one of the brightest periods of their history. The Kakatiyas and their feudatories patronised art and architecture.

On the ruins of the Kakatiya empire, there rose

four independent States—the Reddi kingdom of Kondavidu, the Velama kingdom of southern Telangana, the kingdom of northern Telangana and the Vijayanagar kingdom. During the very rule of Muhammad Tughlaq, some of his subordinates in the Deccan rose in revolt and founded an independent Muslim State in the name of the Bahmani Sultanate at Bijapur, to the west of the Telangana. For nearly two centuries these States struggled for supremacy.

Sultan Quli Qutub Shah, who was appointed the governor of Telangana by the Bahmanis in 1496, declared himself independent in 1518 and founded the famous Qutub Shahi dynasty that ruled over Telangana till 1687. The greatness of the Qutub Shahi kings lies in their contribution to the promotion of literature, art and architecture⁴. They constructed innumerable lakes and tanks and also built palatial mansions. The city of Hyderabad was laid out (1591) by Muhammad Quli Qutub Shah. The Qutub Shahi rule saw its end at the hands of Aurangzeb with the capture of Golkonda fort in 1687. After his death emerged a new dynasty of rulers—the Asafjahis, who came to be known as the Nizams.

Till the close of the 18th century the whole of the Andhra Plateau remained under the Nizams except the extreme south eastern part being under the Karnataka Nawabs. In 1800 the Nizam ceded the districts of Kurnool, Anantapur and Cuddapah to the East India Company. From this date the Hyderabad State remained confined only to the Telangana. The British also obtained the districts of Chittoor and Nellore after abolishing the Karnataka rule and united the whole of their Andhra areas with southern territories constituting the Province of Madras. The conditions remained unchanged till 1947. The Telugu-speaking areas were separated from the composite Madras State and the new Andhra State came into being on Oct. 1, 1953. With the State's Reorganisation Act, 1956, most of the Nizam's territory was merged with Andhra.

Though forces of disintegration have also been at work and sometimes divided the region into smaller political units, uniting factors like the Telugu culture and language and the geographical

homogeneity have maintained the region, wholly or partly, as a single political entity. It is worth pointing out that the land in between the lower reaches of the Godavari and the Krishna has been of a special political and cultural significance. It is not only a fertile agricultural tract but has also served as a gateway between the Andhra peneplain on the west and the coastal plains in the east. Many aspects of the Telugu culture have also originated in this Godavari-Krishna interfluvium.

The Physical Setting

Geology

Geologically the area constitutes a peneplained part of the ancient and stable Deccan block. Though a number of geological formations occur in this region, it is chiefly composed of the gneissic complex of pre-Cambrian origin (Fig. 24.2). The expanse of the gneisses interspersed with granitic intrusions presents a surface monotony throughout the Telangana except on the

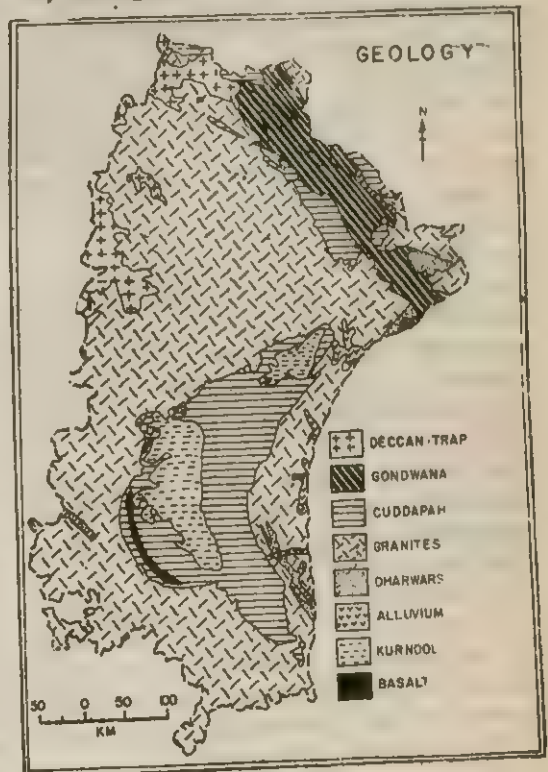


Fig. 24.2

outskirts where the Archaean basement is overlain by the rocks of younger series. To the contrary, in the southern half portion of the region, the gneisses and granites form only a broad outer rim on the west, south and east, the remaining central part being occupied by the rocks of Purana series.

The Dharwar formations, supposed to be more than 2,000 million years old, chiefly consist of schists, and occur in Urvakonda and Dharmavaram taluks of Anantapur district and in minor patches in Mukthal, Atmakur and Gadwal taluks of Mahbubnagar district. These formations can be described as the store-house of useful minerals, the copper deposits in Anantapur district being associated with them. They also attain importance in Anantapur district due to occurrence of gold veins in them.

Next only to the gneissic complex in areal expanse are the Cuddapah which make a crescentic outcrop in Cuddapah, Kurnool, Anantapur, Nellore and Guntur districts. The system is of considerable economic significance as it contains some iron and manganese ores generally interbedded with shales and slates. Numerous workable deposits of barytes and asbestos also occur among the Papaghni in Cuddapah and Kurnool districts. The Cuddapah system again occurs in the extreme north-eastern part of the region where a number of narrow and parallel exposures are noticed on both sides of the Godavari trough. The Cuddapahs are overlain by the rocks of Kurnool series of the lower Vindhyan system which form two separate outcrops, the larger one being located in Kurnool and Cuddapah districts and the smaller one comprising a part of Guntur district in the Krishna Valley.

The Lower and Upper Gondwanas appear in the form of a long continuous belt in the Godavari Basin where they are still preserved owing to their non-vulnerable situation. The Deccan Trap which chiefly originated during the Mesozoic and the Kainozoic eras has got a few extensions in the western and northern parts of the Telangana area. Lastly, a few narrow igneous intrusions are also encountered in Rayalaseema and Nellore district, but areally they are of little importance.

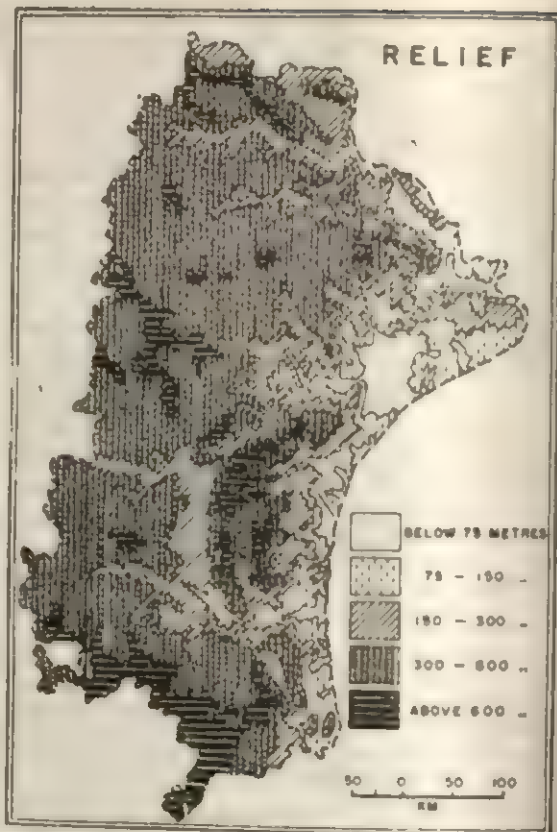


Fig. 24.3

Landforms

The Andhra Plateau may be divided into two major physiographic regions, namely, the Ghats and the Peneplains. Stretching along the eastern limit of the area there lie a series of broken chains of elongated hills forming a large crescentic belt chiefly coinciding with the outcrops of Cuddapah and Lower Vindhyan systems. This hilly belt is, however, not an independent formation but stands as the Andhra component of a larger hill-system widely referred to as the Eastern Ghats. These bear little comparison to the Western Ghats, being relatively more subdued and broken. For a distance of about 150 km between the Godavari and Krishna rivers the belt is completely breached except being traced in the form of scattered rounded hillocks. To the south of the Krishna, the Ghats appear with full swing as Nallamalai, Velikonda, Erramalai, Seshachalam

and Palkonda Ranges varying in elevation from 300 m to about 1,350 m. The ranges are highly dissected and intervened by a number of longitudinal valleys. The hill slopes bear only a thin forest cover owing to scanty rainfall and porous character of rocks. On the hills of Nallamalai live the Chenchus, the most backward aboriginal tribes of the Andhra Plateau. The Ghats have only a few important religious centres like Tirupathi on the Palkonda range and Srisailem on the Nallamalai. The heart of the hilly tract is occupied by the Nandyal Basin which runs from the confluence of the Krishna and Tungabhadra in the north-west to Cuddapah in the south-east and is drained by the Kunderu, a tributary of the Penner. So far as the east-west extent of the basin is concerned, its eastern limit is marked by the western slopes of the Nallamalais while on the western side it is separated by the outfacing scarps of the Erramalais, Seshachalam and Palkonda ranges.

Leaving the Andhra Ghats in the east, the rest of the Plateau, i.e., the Telangana and western Rayalaseema, is a long belt of peneplains chiefly developed on the gneissic rocks. The peneplained belt attains its maximum east-west width in the Central Telangana and thence gradually tapers off towards the south. Its most common levels fall between 300 m and 600 m, the general slope being towards the east as is evident from the alignment of the drainage lines (Fig. 24.3). The general aspect of the peneplain topography consists of the undulating plain surfaces dotted with monadnocks and intersected by almost completely graded river valleys. The relict hills are covered with heaps of granitic boulders present everywhere in varying sizes. Known as *Konda* in the regional language these monadnocks have such a deep penetration in the cultural horizon of the region that many names of the human settlements are affixed with them such as Hanamkonda, Urvakonda, Pattikonda, and so on. Very often the *kondas* also serve as basements for the erection of temples. Bare hills, 'reddish-Khaki' plains with scattered thorny scrub, rivers merely ribbons of sand for half the year or more, tanks banded into the little valleys, all combine to produce a landscape with a desolate and brooding charm.⁵ The

monotony of the common peneplain level is broken in the extreme western and northern Telangana when the lava surfaces marked with flat topped hills rise abruptly over 600 m above the sea level, attaining an elevation of about 800 m at certain places. Similarly the extensions of the Karnataka Plateau in the SW Rayalaseema terminate with outfacing scarps.

Drainage

The region is drained by three river systems, the Godavari, the Krishna and the Penner. While the Godavari and Krishna rise from the Western Ghats in Maharashtra, the Penner originates over the Karnataka Plateau. These rivers are rain-and-spring fed. As they traverse an undulating peneplain littered with hillocks, it is comparatively easy to construct storage tanks for irrigation purposes by putting bunds across their courses (Fig. 24.4).

The Godavari is one of the most important perennial rivers of Peninsular India and is aptly called the *Dakshina Ganga*. After collecting the waters of the Manjra, Penganga, Wardha, Pranhita and Indravati, the river takes a south-easterly bend through its well-known trough, flowing in a deep-faulted gorge. River Krishna divides the peneplain into two administrative regions, namely, Telangana and Rayalaseema. Receiving a number of tributaries, important among which are the Tungabhadra, Dindi and Musi, the river flows in a general west to east direction. However, it acquires a north-easterly trend while passing through a gorge in the Nallamalais. River Penner, along with its two tributaries—Chitravati and Papaghni, first flows in a northerly direction but takes a right angular bend in the Nandyal Basin turning its course due east. On its left the river is joined by two more tributaries—the Kunderu and Sagileru. The streams of the Penner system have successfully carved out a number of wide valleys and thus the most imposing parts of the Andhra Ghats are being subdued.

Climate

The region enjoys a monsoon climate with its characteristic rhythms. On the basis of the local

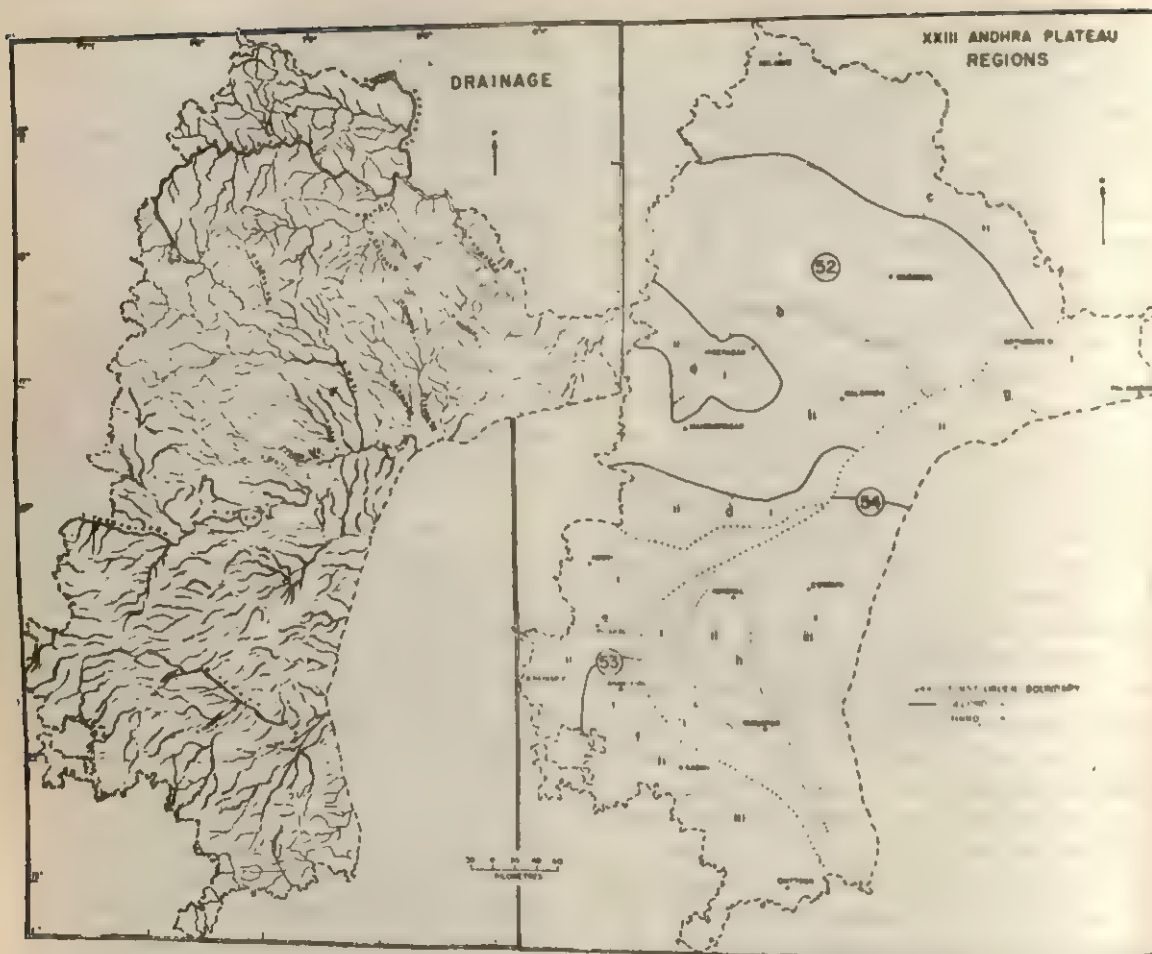


Fig. 24.4

rainfall conditions, four seasons including two monsoon regimes are recognised* : (i) South-West Monsoon (June to September), (ii) North-East Monsoon (October to December), (iii) Winter-Period (January to February) and (iv) Hot Weather Period (March to May).

The season of summer monsoon starts with a sudden outburst of clouds, sometime in the second or third week of June, bringing a general decrease of 3° to 4°C in the mean maximum daily temperature. The rains provide a great relief from the oppressive hot winds. But the increase in relative humidity (over 70%) does not permit the weather to remain comfortable. The intensity of rainfall gradually goes on increasing till

it attains the peak point in the month of September in Western Rayalaseema and Andhra Ghats and in the month of August in Telangana. The period accounts for 85.4% of the total rainfall in Telangana and 58.5% in Rayalaseema. The amount gradually decreases from north to south, Nizamabad district receiving the highest fall (87.5 cm) and Anantapur the lowest (31.1 cm).

The beginning of the north-east monsoon regime is marked by October forming a transition between the summer and cold seasons. The mercury slightly goes up in the first half of October but records a marked fall from the beginning of November. The conditions are a bit different in the southern parts where temperature

recession begins earlier, i.e., from October itself. A significant phenomenon is the reversal of wind direction. The southwesterly winds coming from the Arabian sea yield place to the north-eastern monsoon coming from the Bay of Bengal. The coldest month of the season is December but the temperature nowhere falls below 16°C. The amount of total rainfall by the retreating monsoon varies from a maximum of 33.8 cm (Chittoor) to a minimum of 7.2 cm (Nizamabad). The districts of Rayalaseema receive 27% of their total annual rainfall during this season while the percentage remains only 7.6 for the Telangana districts. Thus the pattern of spatial distribution of rainfall during the northeast monsoon regime is just opposite to that of the summer monsoon.

Though the maximum daily temperature shows an upward trend just from the middle of January, it never goes above 35°C till the end of February. During the cold season the sky usually remains calm and clear and the relative humidity quite low. Rainfall is rare though the Andhra Ghats in January and northern Telangana during February experience up to 2 cm.

The hot weather season or the pre-monsoon period starts with a sharp rise in the mean maximum daily temperature during the month of March. The rise in the mean minimum daily temperature is even sharper. The rate of increase in the temperature is much enhanced during April, and May becomes the hottest month of the year throughout the region. In May the temperature oscillates around 39°C in most of the districts reaching 41°C at a few places like Kurnool and Khammam. The scorching Sun and hot winds make the season quite uncomfortable. The heat is occasionally suppressed by local thunder showers and squally weather in April and May. The amount of total rainfall varies from a maximum of 9.6 cm (Chittoor) to a minimum of 4.0 cm (Nizamabad).

The average of the normal annual rainfall for the region as a whole comes to about 85 cm. Spatially the amount of total normal annual rainfall gradually decreases from north-east to south-west, the amount being more than 120 cm

in the north-eastern Telangana and less than 60 cm in Anantapur and western Kurnool districts of Rayalaseema (Fig. 24.5). The latter is a rain shadow area for both the monsoons as it is located between two uplands—the Karnataka Plateau on the west and the Andhra Ghats in the east. The failure of rains is a common feature of the climate in this part of the Region and somewhat semiarid conditions prevail.

Soils

The soils of Andhra Plateau are mostly residual in origin. They have mostly developed through decomposition of local rock materials except in the important river valleys where transported alluvium is encountered. Generally they are grouped under four main categories—red, black, laterite and alluvial (Fig. 24.5). The *red soils* cover by far the largest part of the region occurring in the form of a large compact block between the Godavari and the Krishna and again occupying a major part of Rayalaseema and parts of Nellore and Guntur districts. These are soils *in situ* derived from the weathering of gneisses and granites. The red colour is due to iron present in a diffused state. These soils, on the whole, are deficient in organic matter, nitrogen, phosphorus and other plant nutrients and the content of soluble salts is very low.⁷ Owing to their free drainage, good aeration and admixture of coarse particles, these are frequently cultivated. In Telangana the locally known *Chalka* soil (red sandy loam) predominates, which is subject to heavy erosion and has poor moisture-retention capacity. It can be made productive only through adoption of improved techniques of dry farming and heavy inputs of organic and inorganic fertilizers.

The *black cotton soils* are generally encountered as narrow strips and at places into wider patches also. Their large stretches are met with in the districts of Adilabad and Nizamabad in the northern Telangana and in Kurnool, Cuddapah and Mahbubnagar districts between the Krishna and the Penner. These are either soils *in situ* or transported weathered materials. Lime in the form of *Kankar* nodules is often present, their concentra-

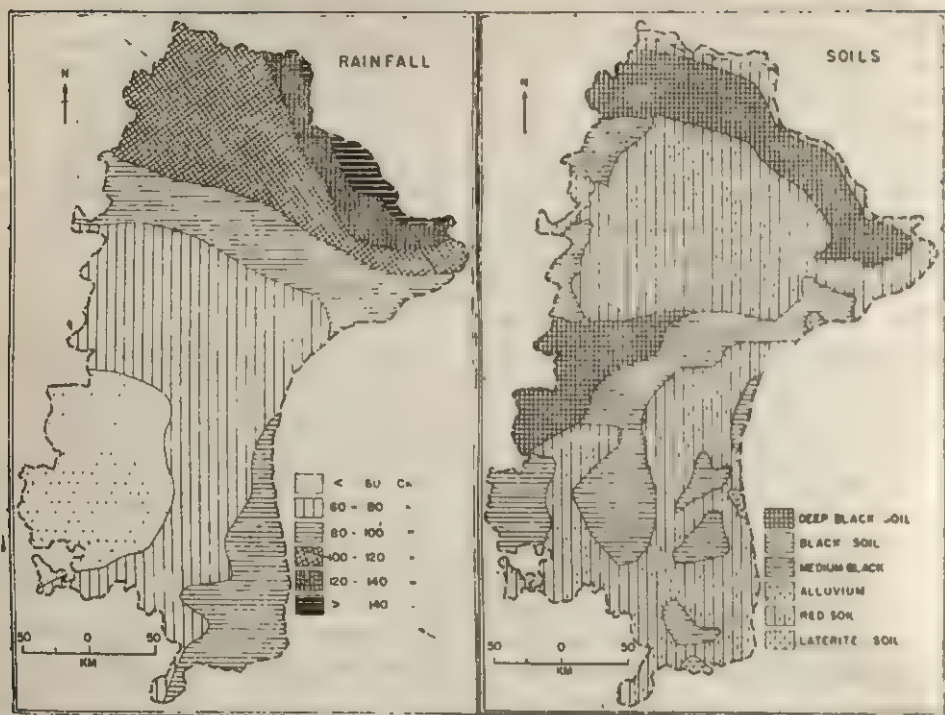


Fig. 24.5

tion increasing with depth. Compared to their red counterparts, they are more fertile and most suitable for cotton cultivation. But the fertility of these black cotton soils largely depends on the local topographical features. On high elevations and sloping grounds the soils are thin, light coloured and less fertile, while in the low lying lands they are thick, deep coloured and fertile.

A lateritic cap has developed over the trap in the Ananthgiri Hill region of Hyderabad district. The soil possesses a brick-like red colour owing to its high iron contents. It is poor in almost all the plant nutrients, organic matters and soluble salts. The low fertility status combined with hard vesicular structure makes it unfavourable for plant growth.

The alluvial soils are met with only along the courses of the Godavari and the Krishna. They are transported soils and have been deposited with alternate layers of sand and silt. The older alluvium has a more clayey texture and dark colour as compared to the recent alluvium of sandy texture and lighter colour.

Natural Vegetation

The natural vegetation^a of the region is preserved in the form of its extensive forests which cover about 24% of the total area. This vast forest cover is very unevenly distributed, its percentage to the total area varying from 47.5 in Khammam to 7.4 in Nalgonda; the other notable districts are Adilabad (39.5%), Warangal (26.1) and Karimnagar (20.9) in Telangana and Cuddapah (31.1), Chittoor (30.5) and Kurnool (28.4) in Rayalaseema. In the remaining districts the proportion ranges between 10 and 20 percent.

The forests may be classified into three broad types : (i) Moist deciduous, (ii) Dry deciduous and (iii) Tropical thorn forests or scrubs. The moist deciduous forests stretch along the north-eastern border of the region occupying parts of Adilabad, Karimnagar, Warangal, Khammam, West Godavari and East Godavari districts where the amount of normal annual rainfall exceeds 100 cm.

The dry deciduous forests occur where rainfall is comparatively low and the rate of evaporation is

high. In the north-western Telangana, Nizamabad district has a large area under these forests, small patches being also located in Karimnagar and Medak. But the bulk of the dry deciduous forests are found in Kurnool, Cuddapah, Mahbubnagar and Guntur mainly on the Nallamalai Hills. Lying almost parallel to this belt on its east, there occurs another narrow strip of this forest type covering parts of Giddalur taluk in Kurnool and parts of Podili, Kanigiri, Udayagiri, Badvel and Sidhaut taluks. Teak is the most important species in almost all the Telangana forests under this type. The Nallamalai forests of Kurnool also contain plenty of teak. Apart from teak, the common species are *Chloroxylon swietenia*, *Hardwickia binata*, *Anogeissus latifolia*, etc. mixed with bamboos. Red sanders is a very valuable variety found on the hills of Chittoor and Cuddapah.

The tropical thorn forests or the scrub jungles are confined to the outer edges of hill slopes where a low type of thorny growth containing acacias *Albizia-prosopis spicijera* and *cassias* is generally found. They are mostly located in Cuddapah, Chittoor and Anantapur districts but spread in the form of small patches throughout the south-western Telangana and western Kurnool district. These scrub lands are in a transitory stage giving way to grass-lands. Soil erosion is in an advanced stage everywhere in these scrub lands and soil conservation and afforestation measures alone can improve their plight.

Minerals

The region is endowed with a large variety of mineral resources important among which are asbestos, barytes, coal, chromite, iron ore, kyanite, mica, china-clay and limestone. Occurrences of graphite, steatite, slate, quartz, talc, gold and diamonds are also locally found.

The Andhra Plateau is the only region in India that produces the crysotite variety of asbestos. The fibre can be spun into yarn and woven into fire-proof clothing. The shorter grades are used for the asbestos cement manufacture. The mineral mainly occurs in Cuddapah district. Like asbestos, almost the entire baryte production in the country is also from the Andhra Plateau, com-

ing from Cuddapah, Anantapur, Kurnool and Khammam districts. Coal occurs in a broad belt in the Godavari basin, covering parts of Adilabad, Karimnagar, Warangal, Khammam and West Godavari districts. At present it is mined at Kothagudem and Yellandu in Khammam and Tandur in Adilabad. Iron ore deposits spread over almost whole of Rayalaseema and north eastern Telangana. Anantapur has considerable amounts of high-grade iron ore contributing 94.3% of the total iron-ore mined in the State (411 thousand tons) during 1966-67. Clays of commercial value, which are useful as ceramic raw materials, are widely distributed in Cuddapah, Kurnool, Nalgonda, Adilabad, Mahbubnagar, Nellore and Medak. Likewise, limestones of cement-grade also cover large areas in Adilabad, Karimnagar Hyderabad, Nalgonda, Mahabubnagar, Guntur, Kurnool, Cuddapah and Anantapur. The lower Kurji limestones of Kurnool and Cuddapah districts, the Palnad limestones of Guntur and the Penganga limestones of Adilabad are noted for their extensive use in cement industry. The Narji limestone from the lower part of the second stage of Kurnool series is used as principal building material in Cuddapah, Kurnool, and Guntur. High grade limestones suitable for chemical and allied industries also come from Kurnool, Anantapur and Adilabad.

Graphite occurs in Kothagudem and Chodavaram taluks. Its working mines are located at Ashwarao pet (Khammam). Slate occurs near Cumbum and Markapur (Kurnool). Large slate formations of high grade, suitable for certain electrical fittings, are also available in a limited quantity near Markapur. Chromite occurs, to a small extent, in parts of Khammam. Small deposits of Kyanite are found near Garibpet in Kothagudem taluk. Mica is chiefly mined in Rapur taluk (Nellore). Kallur village near Khammam is also reported to contain some mica deposits. Occurrences of quartz are met with in and around Hyderabad district and in parts of Kurnool and Anantapur. The material available around Hyderabad is of very high quality, some varieties of which can be used even in optical glass manufacture. Talc deposits are mainly found in Tadapatri taluk

(Anantapur) and to some extent in parts of Sultanabad taluk (Karimnagar) and Kollapah taluk (Mahbubnagar). It is generally used in the manufacture of cosmetics, paints, insecticides, etc. Vajrakur (Anantapur) and Pettavelli (Mahbubnagar) have been known for diamonds but at present there is no production.

Physical Resource Base

The extensive agricultural tracts characterised by a variety of soils comprise the principal resource base. The progress of agro-economy is faced with two great impediments, i.e., meagre rainfall and problem of soil erosion which may only be overcome by the development of ample irrigation facilities and large scale afforestation.

The Plateau is quite rich in its mineral wealth which includes a few rare varieties like crysotile, asbestos and barytes. Anantapur is the richest district in iron ore. About 5% of the total coal production of India is from the Godavari basin. The limestone deposits, particularly their fine varieties, can be used in chemical and allied industries as well. The mining of quartz, slate, talc, kyanite, mica, clays, graphite and chromite is also significant employing a large number of workers. Moreover, resources of Andhra Plateau lie in its forests and water-bodies. The region possesses a total area of about 49,000 km² under forests ranging from the moist deciduous type to thorny scrubs, which contribute several economic products like timber, firewood, charcoal, bamboos, bidi-leaves, sandalwood etc. The Godavari, the Krishna and the Penner constitute the major source of hydel-power and irrigation, actual as well as potential.

The Cultural Setting

Population

The total population of Andhra Plateau is 20,923,786 (1961) which is unevenly distributed (Fig. 24.6). The most peculiar aspect of the distributional pattern is the existence of a few empty spaces covering Nallamalai, Vellikonda and Palakonda Ranges of the Eastern Ghats and parts of the Godavari basin in north-eastern Telangana. The thickly wooded and almost inaccessible rug-

ged terrain in these areas has not allowed any human occupancy to penetrate so far except the presence of a very sparse tribal population. On lower parts of the Ghats, some concentration of population in the inner valleys like those of the Kunderu, Penner, Sagileru and Gundlakamma is, however, observed. In the rest of the region the distribution is fairly even. Nevertheless, the impact of local variations in the amount of rainfall, relief, soil fertility, irrigational capacity and occurrence of mineral resources becomes quite obvious on population distribution. Though the whole of the Plateau is characterised by deficient rainfall, the situation is more critical in southwestern Rayalaseema where it is hard to grow even a single crop in the year; while Telangana with higher rainfall is prominently a double-cropped region. The degree of surface undulations also decreases from south-west to north-east. These sub-regional differences have found a full expression in the trend of population spread. The density of population increases accordingly from south-west to north-east culminating in the south-western parts of Warangal, Karimnagar and Khammam districts which have irrigated paddy crops. The district of Khammam is a centre of mining activity which has attracted immigrant population from the neighbouring areas as also from outside the State. Nizamabad which also exhibits a good agglomeration of population around its headquarters, is perhaps the most prosperous district of Telangana mainly owing to the Nizam-sagar Project on the Manjra. The immigrants from coastal districts have settled in several areas of the district, their habitations giving a distinct appearance of typical delta villages.

The average density of population in the region comes to about 102 persons per km². It is much below the average for Andhra Pradesh (131). The general deficiency of rainfall and plateau character of the region are perhaps the important factors for this comparatively low density. At a sub-regional level the figure is still lower in Rayalaseema (94) but goes a bit higher in Telangana (110). Among the districts, Hyderabad is by far the most populated (266) in the Region. Yet, quite ironically, the district gives a desolate look as

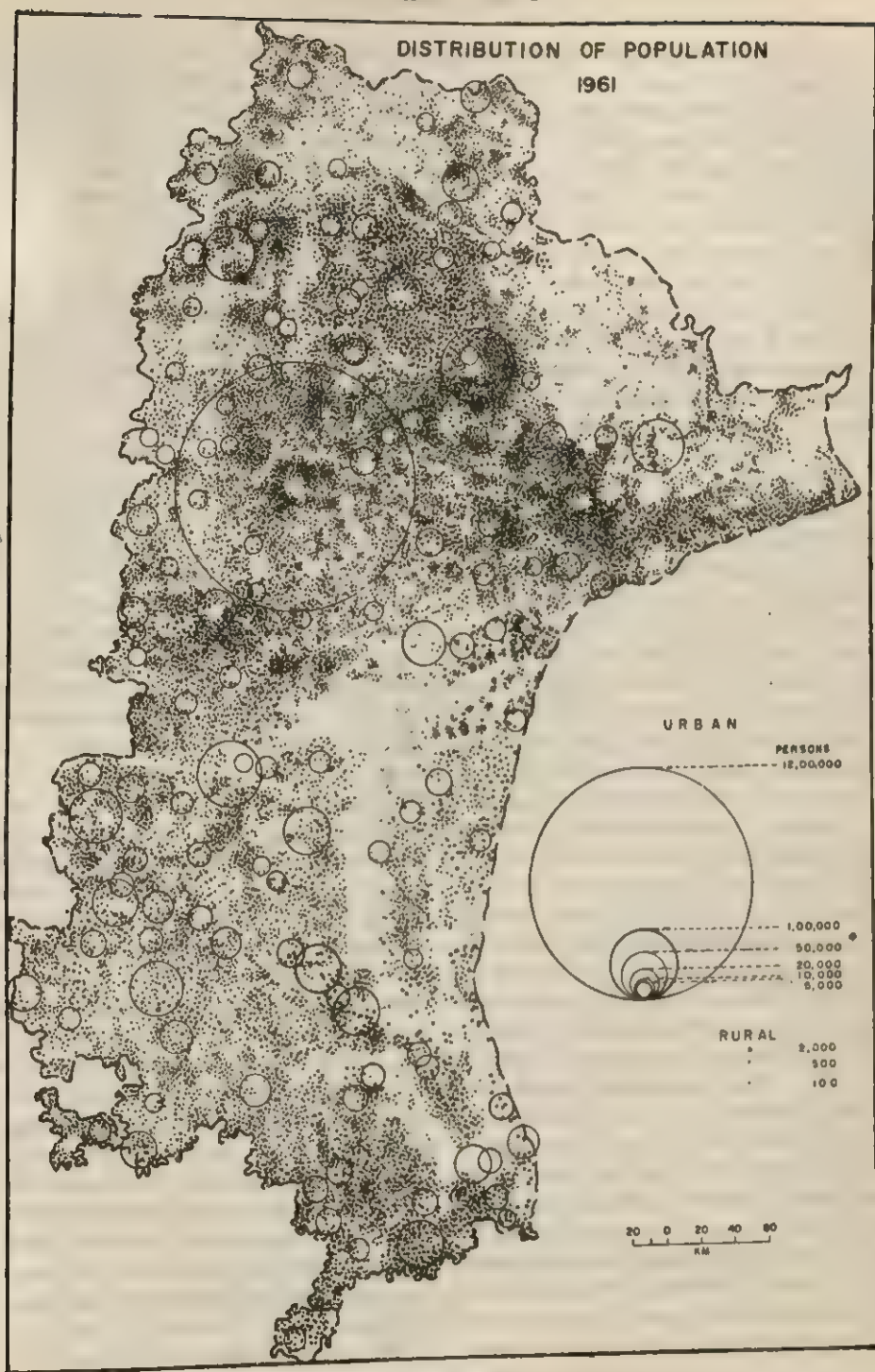


Fig. 24.6

60% of its total population is concentrated within Hyderabad city itself. The other high density districts are Guntur, Krishna and East and West Godavari which are only marginally included in the region. There are five districts, namely, Chittoor, Medak, Nizamabad, Karimnagar and Warangal, which possess a medium density (100-150). Their partly forested character has lowered the density of population. The remaining districts, i.e., Nellore (only partly included), Cuddapah, Anantapur, Kurnool, Mahbubnagar, Nalgonda, Khammam and Adilabad bear a low density (less than 100). Adilabad which lies in the thickly forested Godavari basin records the lowest density (62) followed by Khammam (67).

If considered at taluk level, half of the 134 taluks, wholly or partly included in the region, are marked with population density of less than 100. About two-third of these sparsely settled taluks are spread over the Rayalaseema region and its contiguous districts while the remaining one-third represent the forest-clad hilly tribal areas of north-eastern Telangana. Next to them there is a group of sixty-three taluks where the density varies between 100 and 200. Excluding only a few of these taluks, scattered in the Rayalaseema area, they all lie in a wide stretch passing right through the heart of Telangana from north-west to south-east. The density of population is exceptionally high in the taluks of Hyderabad West (1,176), Vijayawada (409), Warangal (257) and Chittoor (227), mostly owing to the impact of their large headquarters.

Thus, there is a marked region of comparatively high density running across Central Telangana NW-SE. To its northeast the density decreases abruptly and a very sparsely inhabited belt occupies the Godavari trough. To the south of this high density zone there is again a fall, though gradual, in the population pressure. A few taluks apart, the whole of the Rayalaseema and its adjoining areas in southern Telangana and marginal areas of coastal districts represent a low density tract. However, the density again becomes somewhat higher in Chittoor which marks the south-eastern tip of the plateau region.

Trend of Growth : During the last six decades, population of the region has increased by about 93 %. This phenomenal growth has, more or less, been evenly distributed throughout the period except during two decades, i.e., 1911-21 and 1951-61, when quite abnormal trends were noted. The 1911-21 decade was marked by a negative variation of about 2.5 % which occurred owing to a number of natural calamities. After 1921, the decennial growth rate remained oscillating somewhere around 14% upto 1951. During the fifties the rate was enhanced and the 1961 census recorded a positive variation of 16.7 % over 1951 population.

At district level the region exhibited a general increase in its population during the first decade of the present century (1901-11). The percentage of growth ranged from 1.85 in Cuddapah to 45.1 in Medak. The Telangana districts, owing to better agricultural conditions, recorded much higher growth rates than the Rayalaseema districts. The following decade (1911-21), which witnessed a series of natural calamities, was a period of population depletion for the whole region except Chittoor, Adilabad, Khammam and parts of the coastal districts where, too, the rate of increase fell sharply. During seven years of the decade the rainfall was either deficient or irregular. In 1917-18 the prices of foodgrains soared to rates even higher than those prevailing in the great famine of 1899-1900. The long-drawn distress reached its climax in 1918-19 when both the southwest and the northeast monsoons failed, affecting seriously the production of food as well as the cash crops. From the view-point of public health the decade was still a nightmare to those who were fortunate enough to survive the famine onslaught. Plague claimed nearly two lakh lives in the Telangana alone. Cholera and malaria also took a very heavy toll. But considerably more disastrous than all these was the great influenza of 1918-19 which caused more than three and a half lakh deaths in Telangana. The havoc played by epidemics in Rayalaseema districts was still worse.

The span of three decades from 1921 to 1951 experienced a fairly high growth in most of the

Telangana districts as compared to either the Rayalaseema or the underdeveloped coastal districts like Nellore and Guntur. Hyderabad district recorded a very high increase of more than 90%. Mining of coal and iron-ore in Khammam district opened large avenues of employment resulting in a high percentage (70.9) of population growth. In Warangal there was considerable industrial development at Warangal town apart from the flourishing handloom and tanning industries. A good number of agriculturists from Krishna and Guntur districts migrated and settled in this district. Thus, there resulted a positive variation of 63.6% in the district population. With the construction of Nizam-sagar Dam, Nizamabad district also attracted many agricultural families from the Coastal districts. Medak, Karimnagar and Adilabad showed only moderately high growth rates (37.5-42.9%) in comparison with those in Hyderabad and Khammam. Though the Rayalaseema districts with their meagre resources could not keep themselves at par with some of the Telangana districts, the percentage of increase in none of them fell below 30.8 (Cuddapah district) owing to a gradual agricultural, industrial and commercial advancement of the area. As regards the trend in parts of the coastal districts, the rates were quite high in Krishna (63.9%) and West Godavari (51.8%). The growth was moderate in East Godavari (49.8%) and Guntur 40.9% but the percentage recorded in Nellore (28.9) remained the lowest in the whole region.

As densely populated districts of the region are approaching saturation point with regard to their population retention capacity under the existing economic conditions, the sparsely populated districts, in general, have recorded higher growth rates during the 1951-61 decade. The districts having recorded large percentage of increase during this period are Khammam (30.9), Nalgonda (24), Nizamabad (22.4) and Adilabad (21.8). Improvement of law and order conditions after 1951 and better coverage at the 1961 census in Khammam district, institution of a number of tribal development schemes and road construction works in Adilabad district, and construction

of the Nagarjunasagar dam and consequent emergence of Vijayapuri township in Nalgonda district are some of the causal factors worth mentioning in this context. There are eight districts, namely, Hyderabad, Warangal, West Godavari, Krishna, Guntur, Cuddapah, Anantapur and Kurnool which have recorded a moderate growth of 15-20%. The growth remained still low in Chittoor, Karimnagar, Medak and parts of Nellore and East Godavari districts. Considerable emigration of weavers to industrial centres of Maharashtra and the recruitment of labour to projects like Nagarjunasagar and Tungabhadra are the main causes which have brought in the lowest increase of 9.9 per cent in Mahbubnagar district.

The rate of overall population growth during the last six decades has been generally highest in Telangana districts followed by the parts of Krishna, East and West Godavari and Guntur coastal districts. All the districts of Rayalaseema as also parts of Nellore have experienced only a low growth. The high growth rate districts of north eastern Telangana partly lie in the sparsely populated Godavari trough which has shown a fast growing tendency owing to development activities. The southern half of the region, which shows a low population increase over the sixty years and also possesses a poor density, is an underdeveloped tract with low and precarious rainfall, poor soils and very limited irrigational facilities. This part also suffered most under the adverse influence of the great influenza epidemic and scarcity conditions of 1918.

Population Structure : The average sex ratio for the plateau region comes to about 971. Nalgonda where the construction of Nagarjunasagar Project has attracted a large number of male immigrants possesses the lowest ratio (950) in Telangana districts. The sex ratio in Hyderabad (953), Warangal (954) and Khammam (958) districts is also somewhat lower due to urban influence. On the other hand, the ratio is high in Nizamabad (1,007) and Mahbubnagar (1,003) districts. These districts have contributed considerable number of male migrants among weavers to the textile centres of Maharashtra and Gujarat while the

bidi industry has attracted considerable female workers to these areas. Excepting Kurnool (sex ratio 979) all the Rayalaseema districts exhibit low ratio (945-960) which may partly be attributed to the general negligence of female health in these underdeveloped areas. In the upper coastal districts, which are a bit advanced and where maternity services are more frequently available, the ratio is somewhat higher. The imbalance in the urban sex ratio is even greater. The sex ratio in Nalgonda district (848) where male workers outnumber the females at Vijayapuri township is by far the lowest in the region. Other districts of low ratio are Adilabad (903), Khammam (910), Warangal (928), Hyderabad (929) and Anantapur (935). The urban population of Adilabad district, consisting of a considerable number of Government servants, forest contractors and their establishments, colliery and other industrial workers, is mostly made up of male migrants. The development of an industrial city like Warangal, a large coal mining town as Kothagudem in Khammam district and a number of service centres in Anantapur district has also caused considerable immigration of male workers. The urban sex ratio is somewhat higher in Guntur (978), Kurnool (960), Medak (955), Nellore (955), Cuddapah (954) and Mahbubnagar (951) districts.

The proportion of literate population in the Telangana districts, excluding Hyderabad which possesses the highest literacy percentage (35.1) in the region, varies from 11.7 percent in Adilabad, to 15.4% in Warangal. In the Rayalaseema districts the figure ranges from 20.6 in Anantapur to 21.8 in Cuddapah while it records a further increase in the coastal districts reaching upto 30.8 in West Godavari. Thus the Telangana as a whole stands low in literacy; Hyderabad is, however, quite exceptional. The status of female literacy in the region is very much distressing for it falls as low as 4.5 and 4.6% respectively in Adilabad and Khammam districts and, if Hyderabad excluded, nowhere it rises above 9.6% (Kurnool district) in the whole of Telangana and Rayalaseema districts.

Occupational Structure : According to 1961 census about 52 percent of the total inhabitants in

the region are workers. Though the proportion of workers exhibits a very limited variation in the districts, generally it is above the average in Telangana, approaching the average in Rayalaseema and below the average in the coastal districts. The case is quite typical with Hyderabad district where only 40.5% of the total population is gainfully employed. This is mainly due to the presence of a large number of school-going children, dependants, retired persons and beggars in the Hyderabad city.

About 70% of the total workers in the region derive their sustenance from agricultural pursuits. Services and manufacturing including household industry, which give employment to about 9 and 12% of the total gainful workers respectively, are next in importance. The remaining are engaged in trade and commerce, mining and quarrying and construction and transport. Mining and quarrying consisting of more than 3 percent of the active population is a better developed occupation over the plateau as compared to the Great Plains or the country as a whole.

Urban population accounts for 17.2% of the total population, distributed in 131 towns of different sizes; Hyderabad is the most urbanised district (62.2%), while Karimnagar is the least urbanised (7%). Class I Cities account for the highest proportion (41.9%) of the regional urban strength mainly due to the large size of Hyderabad town-group which alone shares 34.7% of the urban total; class III, IV and V accommodate respectively 19.4, 16.7 and 11.6% and Class II shares 10.4% only.

Rural Settlement

Having remained under continuous human occupancy from the pre-Dravidian days, the region has seen the spread and mixing of a number of different cultures. During the early days, when Pre-Dravidian people were establishing human settlements in the region, comparatively more advanced people came in from the north and settled beside the earlier settlements. When the two cultures welded together, the Dravidian Andhras appeared and remained the sole occupants and rulers of the Telugu country till the

downfall of the Kakatiyas in early Medieval days. Then the Muslim culture was implanted in the landscape at places and later the British contact was also established. These cultures have left their imprints on the patterns. A newly migrated community would have certainly preferred to lay its original habitat at a distance from the older ones, the process having a great hand in gradual multiplication of the inhabited sites. After the younger communities had adjusted with the older ones, some of the nearby older and younger settlements ultimately coalesced into composite settlements. Such multi-cultural and multi-nuclei occupance units may be found in the rural areas of Andhra. There are villages like Panchvati, Srisailem and Ahobalam, besides a number of others, which find mention in the great epics and date back to the pre-historic days on the one hand, and the present-day farmsteads lying beside newly constructed wells on the other. Similarly, there are also villages exemplified by Rajawaram in Warangal district where a *Siva* temple forms its ancient nucleus on the one side and a Muslim block developed later on the other.

In the forest covered rugged lands of the Godavari Basin where cultivable land is available only in small patches, the settlements are also of small size. But the transport routes have certainly induced the growth of large villages. Between Adilabad in the north and the Godavari in the south there lies a belt of densely forested areas where a number of large settlements such as Naredikonda, Ichora, Mokhar, Boregaon, Wakadi, Nirmal, etc., have appeared along roads. In the rest of Telangana, where the surface is throughout an undulating plain, small but compact settlements predominate.

In the western Rayalaseema, owing to greater undulations and almost semi-arid conditions, widely spaced large and nucleated settlements dominate the scene. Owing to the scarcity of perennial tanks in the area, wells remain the common source of drinking water. As majority of the wells have only saline water, and sweet water wells are far apart, the inter-village distances are large. Wide patches of dissected hills are either totally devoid of human habitations or are dotted with small villages.

Over the Andhra Ghats the pattern of settlement distribution is chiefly affected by the two major types of landforms, the ranges and the valleys. The high ranges like those of the Nallamalai are practically unsettled, while the scattered patches of terraced fields over the lower ranges comprise tiny hamlets. The wide river valleys, largest of which is the Nandyal valley, are not only rich in fertile agricultural lands but are also least affected by severe droughts and have evenly spaced medium-size villages.

Village Morphology : A cross-section of the general morphological pattern of rural settlements over the Andhra Plateau is presented here through a study of the three sample villages—Rajawaram, Tudimella and Kasapuram (Figs. 24.7-8), representing Telangana, Rayalaseema and Andhra Ghats respectively. Rajawaram (pop. 3,540), situated in Warangal, lies close to the north-eastern bank of a large bunded tank along the Chinnependal-Chilpur Kachcha road, 35 km from Warangal city. Kasapuram (pop. 4,380) is located along the Guntakal-Kurnool road, 5 km from Guntakal in Gooty taluk (Anantapur). Its site falls within a sharp bend of the metalled road and is hemmed between two elongated residual hills lying on its north and south. The east-west alignment of the ridges has obviously given an elongated shape to the settlement. Tudimella (taluk Giddalur, district Kurnool) is situated in the Cumbum valley carved out by river Gundlakamma amidst the Andhra Ghats, 18 km north east of Giddalur along the Giddalur-Cumbum road. The site is bounded by river Gundlakamma on the west and by the metalled Giddalur-Cumbum road on the east. It has again led to a north-south elongation of the site. The village (pop. 4,750), being the largest of the three, exhibits a urban character as is evident from the presence of a number of retail shops, a flour mill and a High School along with a number of elementary schools.

Besides the thoroughfares along which these settlements are located, each of the three villages possesses an important road running through its middle affording a pivotal support to the general build. Minor lanes branch off from the main



Fig. 24.7

artery and after being joined by a few transverse ones lead towards the outskirts. Some of them terminate just within the settlement while the more important ones either lead to agricultural field and other neighbouring villages or to nearby water bodies. The houses are generally grouped into compact blocks demarcated by partly defined lanes. The largest house-blocks are noticed in the core region, their size gradually decreasing outwards.

The general layout of settlement at Rajawaram and Kasapuram is dominated by residences of Reddis, while at Tudimella, Reddis and Baljas have an equally important status. The Reddis who appear to be the most prosperous community over the plateau are big land-owners and live in spacious buildings generally occupying the core areas of the settlements. At Rajawaram their houses are mostly brick-walled with flat

roofs, but at Kasapuram and Tudimella, where stone is more easily available, stone slabs take the place of bricks in house construction. The houses of Baljas, who are also a cultivating class, are almost similar to those of Reddis.

The Brahmins who are economically not so sound as the Reddis owing to their half-hearted devotion to agriculture, have occupied only the outer areas in all the three settlements with houses inferior to those of the Reddis in size as well as in design.

The remaining cultivating castes consist of Muslims, Valimikis and Weavers belonging to the middle and low strata of the village society. Their houses, mud-walled with thatched roofs at Rajawaram and stone-walled with thatched roofs at Tudimella and Kasapuram, are comparatively of smaller size. Potters, carpenters black smiths and gold smiths represent the village artisans



Fig. 24.8

who cluster in small groups. As stone-dressing is an important activity in the region, a caste known as Waddera is solely engaged in this job. The Wadderas occupy a group of small huts in the north-western part of Rajawaram.

Business has got little ground in these rural settlements except at Tudimella which has acquired a good degree of centrality resulting into the growth of a number of business quarters along its main interior thoroughfare. The shops which include retail business, tailoring, shoe-making and restaurants, chiefly satisfy the needs of local population but are also visited by the residents of neighbouring smaller centres. At Kasapuram and Rajawaram only a few small shops are housed in the residential buildings belonging to Muslims and Reddis. Extraction and sale of palm-juice is also a good business over the plateau. The

Gaudus and Idigas derive their livelihood from this practice. They are low caste people and reside in outer parts of the villages in thatched houses. The villages also possess a service class community comprising of barbers and washermen who also cluster on community basis quite away from the higher castes. The Tengus, Lambadis and Harijans generally work as agricultural labourers. The Harijans are found in all the three villages, living in small and dingy houses congregated together, somewhere on the outskirts. The Tengus and Lambadis lead even a more secluded life. Beside the Harijans at Tudimella reside Christians who are a better-off people than the former. As the Ghats and rolling penepains offer sufficient grazing lands, rearing of cattle, sheep and goats is also an important occupation. A large number of herders known

as *Gallas* live at Rajawaram in its north-eastern part where water is easily available in the nearby tank for their herd.

Temples, schools and a few small offices are the only non-residential components of the built-up area in these villages. Rajawaram possesses a large *Siva* temple constructed during the Kakatiya period. Though the temple was deprived of its huge *lingam* by Muslims centuries ago, it is still the centre of a big annual fair on *Sivaratri* day. The Anjaneya-Swami temple at Kasapuram, which attracts hundreds of persons every week, lies a bit detached from the main settlement. A few shops have already come up in front of the temple and a good settlement around this nucleus seems in the offing. Rajawaram and Kasapuram have one Primary school each, while at Tudimella a High school and a number of Primary schools are running. The Government offices are represented by a Forest office at Tudimella and a Village Panchayat office at Kasapuram besides a Post office in each of the three centres. The larger patches of vacant lands are generally used as threshing grounds.

Urban Settlements

It is practically impossible to state as to when the centralising forces became strong enough to introduce urban life in the region, there are a number of towns like Tirupati and Bhadrachalam which are referred to in the epics. As noted earlier, when Chandragupta Maurya ruled in Northern India the Andhras had developed fine network of fortified towns numbering not less than twenty. Throughout history the plateau has been a march-land of warriors moving in north-south as well as east-west directions. This always pressed the ruling powers to guard their strongholds with fortifications which gradually led to urban developments. Warangal, which developed within a series of concentric walls raised by Kakatiya rulers, and standing today as the second largest city of the Region, renders an example of such fort-towns. However, the progress of urbanization on modern lines is a recent phenomenon introduced only after the construction of surfaced roads and railways during the British Rule. A large number of villages which fell on road cross-

ings or were located favourably along the railways, grew into busy commercial centres. A few railway junctions like Guntakal and Kazipet have developed as purely railway settlements.

The momentum of urbanization has increased since Independence. Metropolitan Hyderabad, the State capital, has developed into a large administrative, business, industrial and educational complex, and had continuously been attracting large numbers of immigrants not only from the plateau area but from other parts of the country as well. Kurnool had a great impetus for its growth after formation of the erstwhile Andhra State when capital of the new State was located there for about three years (1953 to 1956). Kothagudem (Khammam district), which for the first time acquired an urban status in 1941, fast developed as a mining centre with a population of 69,728 (1961). Sirpur-Kagaznagar (30,604) and Mancheriyal (13,822) in Adilabad owe their growth to paper and cement industries. Markapur (16,665), on the Guntur-Guntakal metre-gauge line, is thriving well on slate manufacture. Adoni, located as it is amidst a cotton and groundnut growing area, is fast expanding as the chief industrial town of Kurnool engaged in cotton pressing and oil production. Vijayapuri, which solely developed on account of the Nagarjunasagar project, recorded a population of 55,300 in 1961, mostly consisting of immigrant workers. Hyderabad, Warangal and Kurnool, have reached the status of class I cities and Hyderabad (12,51,119) is now a metropolitan centre. Khammam, Nalgonda, Nizamabad, Anantapur, Cuddapah and Adoni are class II towns at present but are shortly expected to join the list of cities.¹² Small towns are still having agricultural base.

The inaccessible thickly forested parts of north-eastern Telangana and the Ghats are marked by the absence of urban centres. Elsewhere the nodal points along the perennial streams or large tanks appear to be the best sites for urban settlements. The streams not only provide drinking water to the towns but in early days they were of great strategic importance. Though in Telangana the centres are well distributed with compara-

tively short inter-town distances, the existence of Hyderabad has certainly come in the way of their progress. To the contrary, in Rayalaseema where resources are comparatively meagre and density of population quite low, the urban centres occur at greater distances but they possess independent fields of action and the intra-town competition is not so acute. The scarcity of water, particularly for drinking purposes, is the main hurdle in development of Rayalaseema towns. Lack of adequate and strong industrial base has, indeed, inhibited urban development so much so that over one-half of the towns in the region are supported by primary or low order secondary functions. The accelerated growth of the metropolis of Hyderabad has, however, been generated more by extra-regional factors since its immediate region is a resource-scarce area.

Urban Morphology : To present a cross-section of the general morphological pattern of urban settlements in the Region, Warangal, Guntakal and

Giddalur representing Telangana, Rayalaseema and Andhra Ghats respectively, are considered. Warangal (1961 pop. 1,33,130), the district headquarters, occupies its site amidst a thickly populated open country, not far away from the forested Godavari trough in the north-east. The city has got direct rail-links with Delhi, Madras and Hyderabad. It is a multi-nuclei settlement developed in the form of a crescentic ribbon (Fig. 24.9). The role of tanks and hills, situated within the crescentic bend, in giving the town its present shape is quite obvious. The ancientmost nucleus is Hanamkonda area lying north of the hill bearing the same name. Though Hanamkonda dates back to the pre-Buddhist period, the nucleus comes in clear picture only in the 8th century when it was known as 'Orukal' and served as the capital of *Tulva* Andhras. During early medieval days the growth of Hanamkonda received a great impetus as seat of the Kakatiya rulers until the capital was shifted to their newly constructed fort¹⁸ in a south-eastern

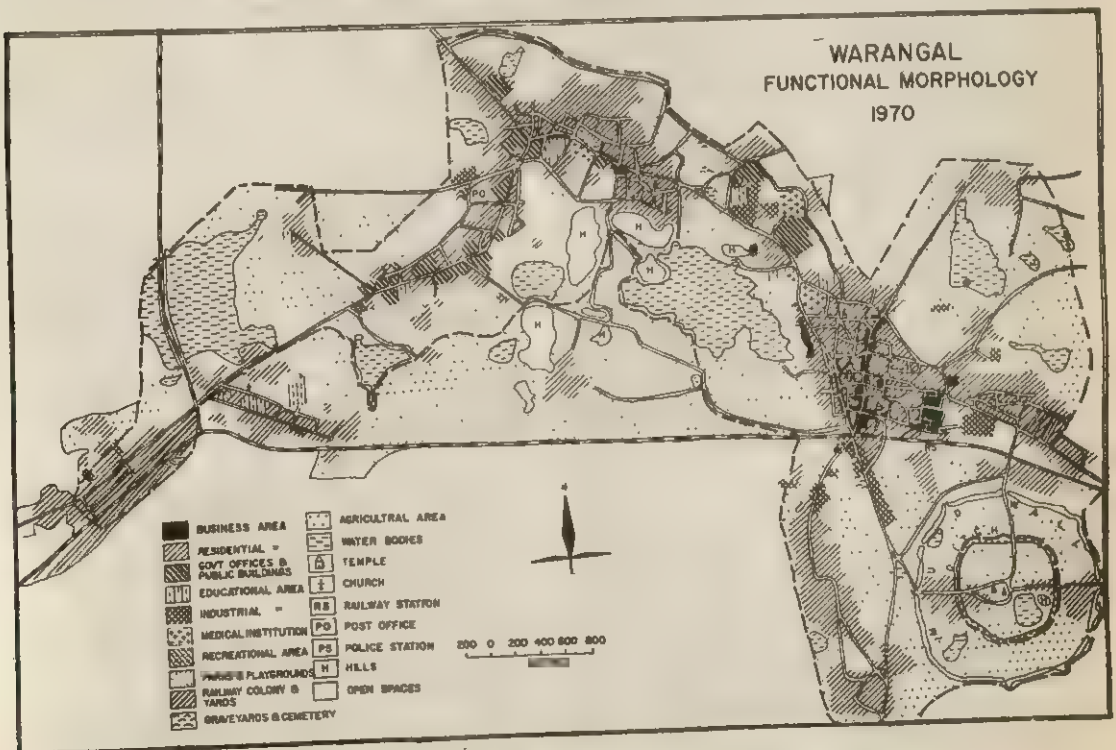


Fig 24.9

suburb surrounded by 48 km long outer wall, being marked by the ruins of a large Shiva temple. Under the Kakatiya kings like Ganapati (1200-1261) and his daughter styled Maharaja Rudra, the fort area developed into a prosperous township and remained almost as such till the close of the first quarter of the 18th century when Warangal fell under the sway of Nizam and permanently lost its capital position. In 1926 when Warangal was declared the headquarters of a *suba*, the construction of government offices was undertaken. Around these buildings there also developed a cluster of shops and dwellings. This nucleus now forms a locality called *Subedari* near Hanamkonda. Another factor which contributed to the growth of the city was the construction of the two railway stations at Kazipet and Warangal during the last decade of the 19th century and within twenty years a densely populated locality at Kazipet came into existence. The Asaf Jahi Cotton Mills and a number of rice and oil mills were also established in the vicinity of Warangal railway station between 1931-48. These industrial units formed small nuclei around which the built-up areas developed extensively. During the post-Independence period not only the big institutions like the Regional Engineering College, Kakatiya Medical College and Mahatma Gandhi Memorial Hospital have come into existence but the residential and business areas have also shown tremendous growth.

Guntakal (pop. 48,083 in 1961) lies on an undulating surface surrounded by open lands on all sides in taluk Gooty (Anantapur). The town, located on the Bellary-Gooty main road, is one of the biggest railway junctions of the South-Central Railway having direct connections with Bombay, Madras, Bangalore, Bellary, Secunderabad, Guntur and Hubli. Prior to the incoming of the railways, the town was only a small village now known as old Guntakal. It has now grown as a great entrepot of the Rayalaseema region. The town is a large collecting centre of cotton, groundnuts and oilseeds. The scarcity of water has however marred its progress as a flourishing industrial centre. (Fig. 24.10)

Giddalur (pop. 12,084 in 1961), a taluk head-



Fig. 24.10

quarters in Kurnool, is located on a flat ground surrounded by hill ranges in the north, east and south-east and by river Sagileru in the west. It enjoys a cross road site and is also a railway station on the Guntur-Guntakal line. The sparse population and rugged terrain of its hinterland have retarded its growth. It still looks like an overgrown village.

Business is the most important function in all the three centres. Warangal, in addition to the chief business areas along the main thoroughfares in Warangal proper, has detached marketing pockets at Hanamkonda and Kazipet. Haphazard arrangement of shops is rather a rule except at the wholesale grain market located opposite Warangal railway station. The business activity at Guntakal is concentrated in a continuous belt on both sides of the C. C. Main Road in the heart of the town. A few transverse offshoots of the belt are also noted including the wholesale market. The petrol depots have sought their sites close to the railway junction while other godowns are located on the outskirts along the main roads. The trade at Giddalur is chiefly of retail type. The older and bigger establishments represented by cloth shops, hotels and restaurants, banks, tailoring shops and goods transport agencies are again confined to the interior region of the settlement. Recently a narrow ribbon of small restaurants and fruit shops, meant especially to cater the traffic moving to and from the railway and bus stations, has also come up along the Ongole-Nandyal road

Residential areas occupy the major part of the built-up zone. The old residential localities, characterised by narrow lanes, predominate. As one moves inwards from the outskirts, the horizontal congestion and vertical extent of the buildings go on increasing. The modern style buildings are comparatively few in number and have mostly sprung up in the outer areas. The sizeable industrial concerns like the Asaf Jahi Mills at Warangal and the Rayalaseema Steel Rolling Factory and the Andhra co-operative societies spinning Mill at Guntakal have constructed their own planned residential colonies. The government residential buildings, chiefly comprising spacious bungalows for officers located in *Subedari* area at Warangal, are a class in themselves. Stone-slabs are the most popularly used building material in these towns. However the poorer houses are roofed with palm-leaves.

Industrially the towns are not much advanced. Large and medium size factories, which may claim any prominence in the general view of the urban landscape, are small in number; they have mostly acquired sites along roads near railway stations. The small scale industries are scattered throughout the built-up areas.

All the three towns possess railway yards and colonies. But the land under this use attains special dimensions at Guntakal where about half of the total urban area is covered by yards, residential colonies, offices, etc. all belonging to the railways. Beside the railway quarters there also lie two privately owned colonies—one belonging to the railway porters and the other to labourers.

The religious institutions like temples being objects of daily visits by the local population are often located in the heart of the towns. The Thousand-pillar temple belonging to Kakatiya period at Warangal deserves special mention as it has acquired a national importance and attracts a large number of tourists every day. The mosques and churches have a direct bearing on Muslim and Christian localities respectively. The educational institutions and hospitals are located generally towards the periphery. The maintenance of parks in the plateau towns is greatly handicapped by water scarcity. As such, the

parks are few in number and those, too, of very small size.

Hyderabad City : The metropolitan city of Hyderabad covering an area of 220.36 km² is the primate city of the Andhra Plateau. It comprises nine units, namely, Alwal, Attapur, Bowenpalle, Fatehnagar, Hyderabad and Secunderabad Divisions of Hyderabad Municipal Corporation, Kondikal, Lalaguda, Macha Bolaram, Malkajigiri, Osmania University, Secunderabad Cantonment and Zamistanpur which have come into existence in phases. The settlement had its origin in the 16th century under the Qutub Shahi rulers of Golconda, when the historic fort was erected there. The habitation, in its initial stages, was confined only within the walls of the fortress but to relieve congestion therein the nucleus of the city of Hyderabad was constructed on the southern bank of the river Musi in 1591. Named originally as Bhagyanagar, the new settlement was chiefly a residential colony for the nobles of the Qutub Shahi Court. The expanding town suffered a setback in 1687 when Golconda was conquered by Aurangzeb and the capital of the Deccan shifted to Aurangabad. However, Hyderabad again became the capital in 1763 which brought a momentum for rapid progress. The establishment of the British Residency on the northern bank of the Musi and construction of Kacheguda and Nampally railway stations attracted new developments. Secunderabad developed entirely as a British Military Cantonment. The concentration of the industries in Mushirabad area and the location of the University on the north-eastern outskirts led to further expansion. Similarly, in the more recent past, the construction of the Government staff quarters at Malkapet along the Masulipatam road, the emergence of a modern residential area over the Banjara Hills and the establishment of the Industrial Estate in north-western corner of the city have all led to enormous growth.

There is a marked concentration of business activity in the hearts of the twin-cities of Hyderabad and Secunderabad (Fig. 24.11). The remaining functions have developed haphazardly and as such, it is quite difficult to find out any regular functional zones. However, a tendency towards

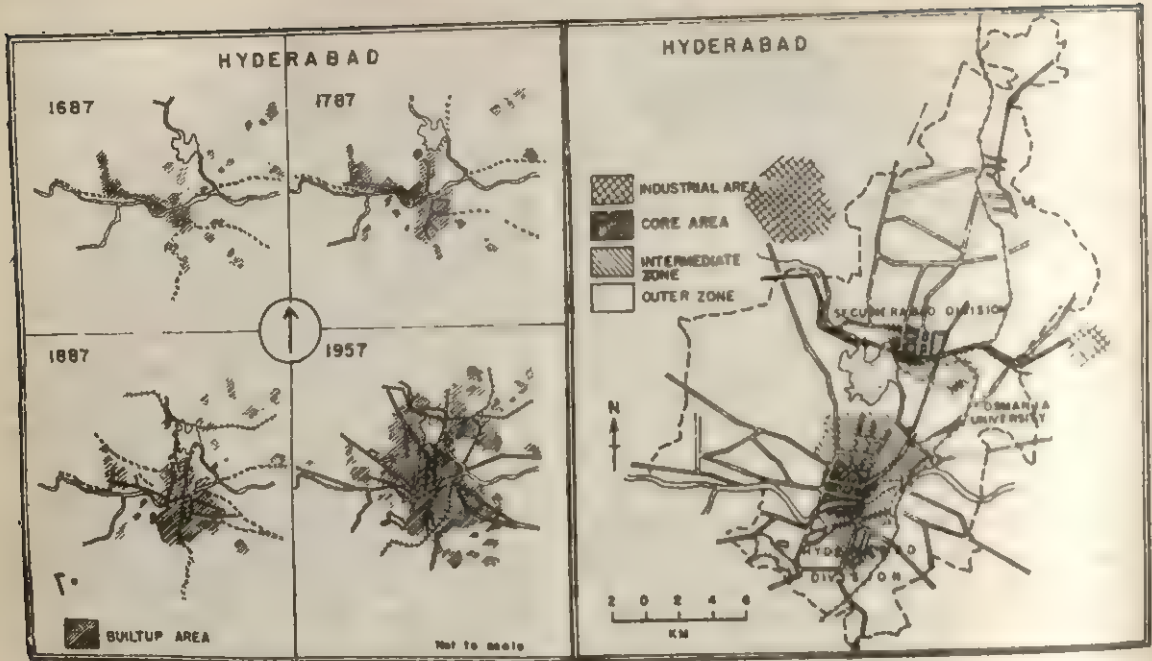


Fig. 24.11

concentration of the industrial activity in Mushirabad and Moulai areas on the east and Sanathnagar area on the north-west is visible. Likewise, the university area is distinctly educational.

The long association of the city with the Muslim rule as well as the presence of a large immigrant population from different parts of the country have given it rather a cosmopolitan character.

Agricultural Economy

The ruggedness of the topography, the infertility of the soils and the semi-arid climatic conditions have adversely affected the agriculture of the Region, which is still the backbone of the regional economy, employing over 70% of working population and contributing over 40% to Region's income. A great handicap to agriculture, particularly in Telangana, had been the *Jagirdari* system which prevented the emergence of a strong middle class peasantry, having both labour and capital resources. In general, per capita agricultural income has been low, Telangana having lower (Rs. 100) than that of Rayalseema (Rs. 159).

Over 40% of the total land in the region is under

net sown area which also includes 2.5% double cropped tracts. Shortage of water has rendered plantation a difficult task and hence the land under miscellaneous tree crops and groves not included in the net sown area comes to even less than 1%. About 14% of the area is represented by current and other fallow lands which have temporarily been out of cultivation for a period not exceeding five years. A further 4.3% classified as culturable waste may also be brought under plough with improved methods of cultivation and reclamation measures. With the increasing population, permanent pastures and other grazing lands are gradually shrinking, their present proportion being about 4%. Land put to non-agricultural uses, covers 6.2% of the total area. A fairly large proportion (over 24%) is under forests. The rest (about 7%) is barren and unculturable.

The agricultural resource base is not uniformly strong over the entire region. On district level the percentage of net sown area to total area varies from 27.3 in Khammam to 51.3 in Mahbubnagar. In all, there are five districts, Nalgonda, Medak, Mahbubnagar, Kurnool and Anantapur which have over 45% of their area as not sown. Nal-

gonda, Medak and Anantapur are the least forested and the remaining have small acreages under fallows, pastures and tree crops. Owing to predominance of forested tracts the percentage of cultivated area falls to less than 35 in Adilabad, Khammam, Cuddapah and Chittoor. The parts of coastal districts also possess similarly low proportions under net sown. The remaining four districts—Hyderabad, Nizamabad, Karimnagar and Warangal are close to the regional average. Thus, in general, the percentage of net sown area decreases from west to east.

Irrigation : The low and variable character of rainfall makes the plateau a single cropped region. The Rayalaseema area with low rainfall, low water table and serious soil-erosion forms a famine zone. Storage of water by putting dams across rivulets has been a part and parcel of the Andhra culture as is evident from the existence of innumerable reservoirs. The construction of major irrigation projects on modern lines was initiated during British rule as early as 1870 when the East India Company sponsored the Kurnool-Cuddapah Canal mainly as a navigation project. The only other large scale irrigational scheme undertaken prior to Independence was the Nizamsagar project completed in 1930 by putting a dam on the Manjra. Among the recent projects the Nagarjunasagar is notable which is a multipurpose with an irrigation potential of 6.5 lakh acres, mostly in coastal areas. The Kadam project in Adilabad was completed in 1958. The Pochampad reservoir project (1963) is designed to irrigate about 5.7 lakh acres in Nizamabad and Karimnagar districts. Anantapur—the largest scarcity hit-district in Rayalaseema, is served by two major projects, Bhairavanitippa and upper Penner. The district benefits from the Tungabhadra project canals as well.

Over 17% of the net sown area is irrigated. Tanks share about half of the total net irrigated area. Wells and canals account for 25% and 21% respectively. Tube-wells are now proving a good attraction for progressive farmers but the area covered is negligible (less than 1%).

In North-eastern half of Telangana tanks account for over 60% of the net irrigated area in Khammam, Warangal, Adilabad and Medak

districts. But in the Rayalaseema, only wells come to rescue sharing 44.5% of the net irrigated area in Cuddapah, 38.5% in Chittoor 38.4% in Anantapur and 16.9% in Kurnool. The districts having distinguished position in canal irrigation are Kurnool (53.0%), Nizamabad (43.5%), Adilabad (30.3%) Cuddapah (29.7%) and Nalgonda (26.0%).

The cropping pattern in the region is characterised by the predominance of food crops, their percentage to the total arable area varying from 73.1 to 91.5 in Telangana, 63.2 to 69.0 in Rayalaseema and 76.2 to 89.3 in coastal districts. Thus in the Rayalaseema the non-food crops exhibit a somewhat better position but it is no indicator of a prosperous agricultural economy there. Millets are the only food-crops which give satisfactory yields in Rayalaseema. Rice is imported here from coastal areas. Therefore, the farmers turn to cash crops like groundnuts, cotton and tobacco which are not only paying but also more suited to the climate and soils of the area. In general jowar, paddy, bajra, ragi and grams are the chief food crops grown widely. The proportion of jowar which is most widely grown in seven out of nine Telangana districts and also in Kurnool district of Rayalaseema, covers nowhere less than 10% of the total cropped area except in Chittoor while its upper limit goes upto 43.8% in Khammam. Paddy generally comes as the second important crop in the districts but occupies first place in the coastal districts as also in Nizamabad and Karimnagar under canal irrigation. All kinds of pulses, taken together, account for 10% to 20% of the total cropped area in more than half of the districts. The proportion of area under bajra and ragi is insignificant (less than 5%). Among non-food crops groundnuts get the first priority covering 34.6% of the total cropped area in Chittoor, 32.0% in Cuddapah, 24.1% in Anantapur, 21.0% in Kurnool and 12.5% in Mahbubnagar. Telangana monopolises in the production and acreage of castor seed. Nearly 84% of the total area and 82% of total production of this crop in the State (1965-66) comes from this region and particularly the districts of Nalgonda, Mahbubnagar and Hyderabad contribute over 70% of the State's total pro-

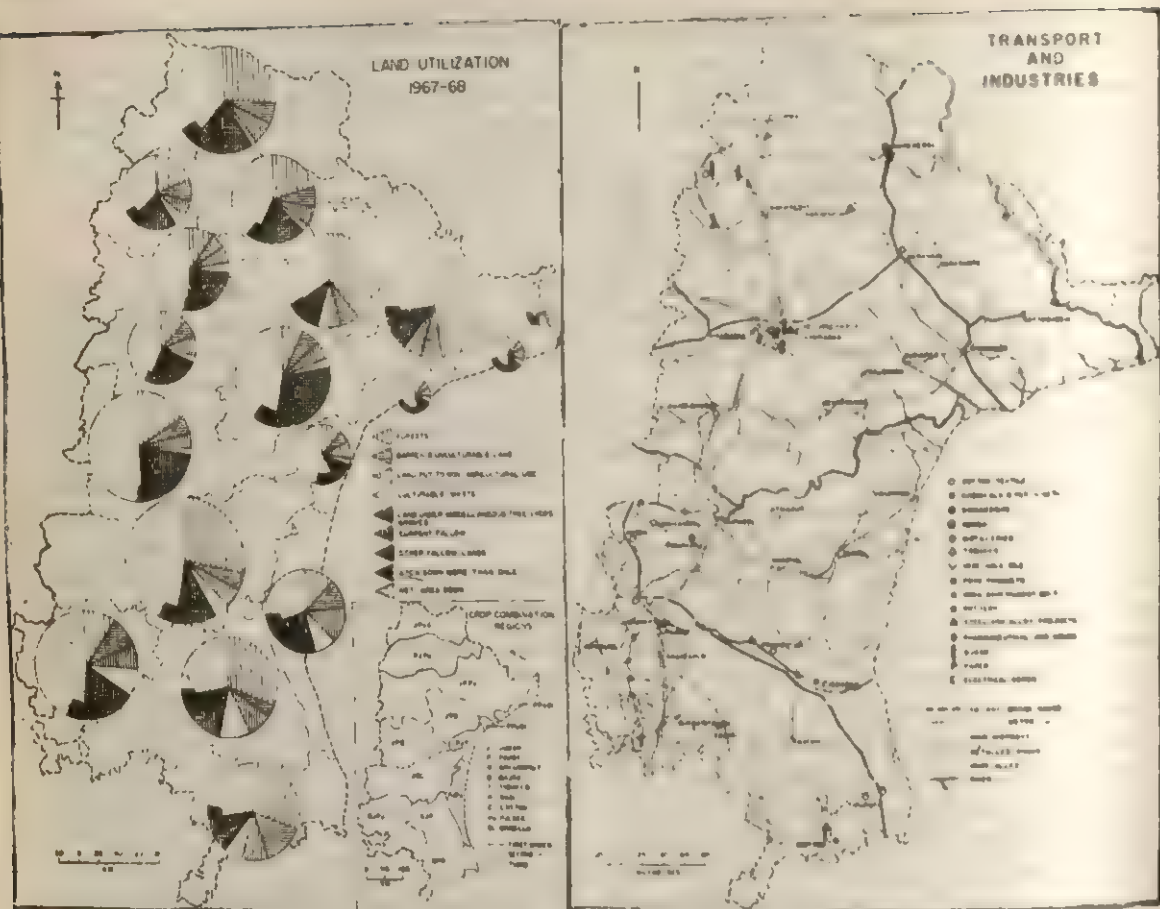


Fig. 24.12

duction. Cotton attains special significance in Adilabad (13.7%) and Kurnool (12.4%) owing to large areas under black soil. The acreage allotted to tobacco seldom goes over 2%.

Recently (since 1962) an upward trend is visible in the area and production of commercial crops, particularly-groundnuts and sugarcane, and the indices at district level remained below the base year level for food crops, especially jowar and rice.

Crop-Combination Regions : Spatial variations in the amount of rainfall, nature of soil and availability of irrigation water have resulted in the development of a number of crop-combination regions in the area (Fig. 24.12). Jowar occurs as first order crop (on area basis) over a large tract comprising Medak, Warangal, Khammam, Hyderabad, Mahbubnagar, Nalgonda and Kurnool dis-

tricts in the heart of the plateau and Adilabad district at the northern tip. Paddy led combinations are a characteristic of not only the coastal districts but also of Nizamabad and Karimnagar. Similarly, groundnut ranks first in the three southern districts of Rayalaseema. Thus, three first order crop-regions are noticed. In the jowar-region paddy occurs throughout as the second rank crop except in Kurnool and Adilabad districts where it is replaced by groundnuts and pulses respectively. The groundnut region is divided into two second order regions—(i) Groundnut-Jowar region (Anantapur and Cuddapah) and (ii) Groundnut-paddy region (Chittoor district). In the paddy region also two second-order crops are found, viz., jowar in Nizamabad, Karimnagar, Nellore and Guntur districts, and 'pulses in parts of Krishna

and East and West Godavari. Variations within the second order crop-combination regions are further noted with respect to the third rank crops. The jowar-paddy region constitutes three crop associations, i.e., jowar-paddy-pulses in Hyderabad, Medak, Warangal and Khammam; jowar-paddy-groundnut in Mahbubnagar and jowar-paddy-bajra in Nalgonda. The groundnut-jowar region has two third order combinations, viz., groundnut-jowar-pulses in Anantapur and groundnut-jowar-paddy in Cuddapah. Lastly, the paddy-jowar region is also marked with two associations, paddy-jowar-pulses in Nizamabad, Karimnagar and Nellore and paddy-jowar-tobacco in Guntur. Thus, though the plateau exhibits a good areal variation in its crop-combinations the change from one crop to another is very gradual. For example, groundnuts occur as the first order crop in the southern Rayalaseema, attain second rank in northern Rayalaseema and have third place in Mahbubnagar, gradually disappearing northwards.

Livestock : Animal husbandry is next only to cultivation as an important component of agricultural economy over the plateau. Out of over 22 million total livestock (1966), 20.9% are bullocks and he-buffaloes used for plough, carts and water lifting. Cows and she-buffaloes representing together 22.6% are the chief milch cattle. As grazing lands are still available in abundance, sheep (27.7%) and goats (11.6%) are also found in quite large proportions. Pigs, donkeys, horses, ponies, mules and camels are insignificant (less than 2%).

Industrial Economy

The region is industrially underdeveloped. Leaving apart the parts of coastal districts, which are badly lacking in industries, the percentage of industrial workers to total workers in the rest of the region, i. e., Telengana and Rayalaseema, comes only to 12.8 (1961). The underdeveloped nature of the industrial sector becomes further conspicuous from the fact that over 80.4% of the total industrial population is engaged in household units—working on time-consuming traditional lines. On sub-regional level the proportion of workers employed in manufacturing other than

household industry in Telengana is almost double (23.2%) of that in Rayalaseema (12.0%). The number of large and medium size factories (96)¹³ is too small as compared with the strength of small scale units (about 2,000), yet the former is capable of employing more than 90% of the total factory workers. Another important feature of the industrial personality of the region is an unusual concentration of the manufacturing activity in the Hyderabad metropolitan area. The city not only possesses 60 out of the total 96 large and medium size factories but also shares not less than 51.7% of the small scale units and 52.5% of the workers employed therein. Structurally, there is a clear predominance of resource-based industries run on local raw materials.

Large and Medium size Industries : Among the large and medium size industries (Fig. 24.12) agro-based group covers the largest range, cotton textile being most important. Of the 17 cotton textile mills in the region, 4 are located at Hyderabad, and another 4 in Kurnool district. The remaining are shared by districts of Chittoor, Cuddapah, Anantapur, Mahbubnagar, Adilabad and Warangal. Adoni in Kurnool is the most specialised centre and may shortly surpass even Hyderabad with respect to number of factories. Manufacture of vegetable and other edible oils from oil-seeds, groundnut, cotton seeds, etc., is also an important industry but, unlike the cotton textile, it is concentrated only at a few places like Secunderabad, Kalluru, Adoni and Guntakal. There are only three sugar factories on the plateau, two of which including the Nizam Sugar factory at Budhan, the largest in India, are situated in Nizamabad district while the third one is in Chittoor. Over half a dozen units are busy in preparation of various food articles like biscuits, starch and a variety of wheat products. Large scale tobacco industry is represented by two cigarette factories with a total capacity of 405 million pieces per day at Hyderabad.

The Andhra Plateau offers a good base to chemical and fertiliser industrial group—eight units being concentrated at Hyderabad itself and one each at Ramavaram in Khammam and Sirpur in Adilabad. Engineering industries are divided

into a number of sub-groups, e.g., machinery and machine tools, agricultural implements, machine and spares, watches and clocks, cycle and cycle parts, and so on. All of them, including the Hindustan Machine Tools, again belong to the very metropolis. Manufacture of steel and alloy products is a part of the industrial activity of Hyderabad and one of the most important at Guntakal.

The Sirpur Paper Mills Ltd., Sirpur (Adilabad) is the only representative of forest-based industries in the Region. Similarly the mineral-based industries are represented by cement factories installed one each in Karimnagar, Adilabad, and Kurnool districts. The Singareni collieries at Kothagudem comprise one of the largest coal mining centres in the country. With their existing capacity of 15 lakh tons of coal per annum the mines have attracted workers in large numbers from neighbouring areas and are further going to change the whole of the surrounding landscape into an industrial complex with the prospect of a thermal station, fertiliser factory, etc., which are gradually coming up. Among the factories manufacturing electrical goods and equipments, the Bharat Heavy Electricals at Ramachandrapuram (Hyderabad) bears special significance. Pharmaceuticals and drugs, distilleries including alcohol producing units, pottery, cement and asbestos products and the India Government Mint are also notable, being mostly concentrated at Hyderabad.

Small scale Industries : There is a wide range of industries under this category. In all, the Region with 2,025 such units employs 29 thousand workers. The twin cities of Hyderabad and Secunderabad alone account for 10+1 units and 15,400 workers. Iron and steel manufacturers and agro-industries are by far the most important groups sharing 15.1% and 12.1% of the total workers respectively.

The household industries, engaging more than four-fifths of the total industrial population in the Region, are much more widespread than the industries discussed above. They may be seen even over the Ghats which are totally lacking in factory manufacturing. As regards their compo-

sition, the textiles account for the largest proportion of workers in most of the districts except in Mahbubnagar, Hyderabad, Nizamabad, Adilabad, Khammam, Chittoor and Nellore. The proportion is particularly high in Karimnagar (55%). The district is noted for its handloom industry. While the workers in livestock and fish-based industries generally take the second place in most of the districts, they account for the highest proportion in Mahbubnagar, Hyderabad, Adilabad, Khammam, Chittoor and Nellore. In the western taluks of Mahbubnagar, sheep rearing and *cumli*-weaving is very widespread. In Kurnool and Khammam nearly 15% of the workers in household industries are engaged in forest-based industries, such as the palmyra or bamboo mat and basket making and coir industry. The proportion of mineral-based industries goes over 10% (11.34%) only in Hyderabad district. This is largely due to a concentration of brick and tile manufacture and earthenware manufacture in the rural areas around the city. The engineering and chemical industries, printing, book-binding and manufacture of jewellery, musical instruments, stationery articles, sports goods, etc., may be mentioned among the other important household industries.

Transport

The means of transport consists of railways, roads, waterways and air ways, railways being the most important. Coal, iron ore, cement, manganese ore, foodgrains, oilseeds and sugar are the chief commodities transported. The northern portion of the area is served by the South-Central Railway and the southern by the Southern Railway, both consisting of broad and metre gauge lines. The Delhi-Madras and Bombay-Madras trunk lines pass through the north-eastern and southern parts respectively. Between these two trunk lines are a number of interlinks, notably those linking Kazipet (Warangal)—Wadi, Guntur—Guntakal and Guntakal-Secunderabad. At many places, e.g., Secunderabad, Guntakal, etc., there arises a problem of transshipment causing interruptions in smooth running of traffic. On the whole, the western half of

the plateau is relatively better served than the eastern half (Fig. 24.12). Andhra Ghats and the forest clad Godavari trough are most inadequately served by railways except for a few transverse routes. Industries, an important causal factor for construction of railways, are also lacking in the eastern part except the coal mines at Kothagudem.

Road mileage is also inadequate for its large area, the road density being 6.8 km/100 km². The efficiency of the road transport is handicapped due to its uneven distribution and is further aggravated by numerous breaks in the existing system. Two National Highways, Nos. 7 and 9, pass through Hyderabad city. The metalled road net is well developed in the western Telangana with Hyderabad as its centre and in western Rayalaseema with Anantapur, Cuddapah, Kurnool and Guntakal as the main foci. The district of Adilabad, northeastern parts of Karimnagar, Warangal and Khammam, and the Ghats have the most underdeveloped road transport.

Water transport is limited only to the lower courses of rivers Godavari and Krishna. In Godavari, however, boats ply upto Chandrapatla located at the north-western boundary of Warangal district. The inland water transport is generally carried on by slow moving country boats.

Begumpet at Hyderabad remains the single aerodrome on the Air map of the region linking Hyderabad with Delhi, Bombay, Bangalore, Madras and Calcutta with regular flights.

The Regions

The Region, no doubt, is essentially homogeneous in many respects, e.g., its plateau character, geological background, deficient rainfall, the Telugu culture; yet spatial variations in physical and cultural phenomena like relief, actual rainfall amounts, soils, natural vegetation, population density, settlement pattern, crop combinations, industrial landscape, transport system, etc. have brought in considerable diversities at sub-regional levels. Thus the Andhra Plateau may be divided into there first order, eight second order and eighteen third order regions as follows (Fig. 24.4) :

XXIII. Andhra Plateau

52. Telangana

- a. Hyderabad Plateau
 - (i) Hyderabad Plateau East
 - (ii) Hyderabad Plateau West
- b. Telangana Peneplain
 - (i) Telangana Peneplain North or Warangal Region.
 - (ii) Telangana Peneplain South or Mahbubnagar-Nalgonda Region
- c. Central Godavari Valley
 - (i) Central Godavari Valley West or Adilabad Region
 - (ii) Central Godavari Valley East
- d. Middle Krishna Valley
 - (i) Middle Krishna Valley East or Nagarjuna Region
 - (ii) Middle Krishna Valley West or the Krishna-Tungabhadra region

53. Rayalaseema Uplands

- e. Rayalaseema Peneplain
 - (i) Rayalaseema Peneplain North or Adoni Region
 - (ii) Rayalaseema Peneplain South or Raydrug-Guntakal Region
- f. Rayalaseema Plateau
 - (i) The Penner-Chitravati or Anantapur Region
 - (ii) The Chitravati-Papaghnu or Kadiri Region
 - (iii) Chittoor Region

54. Andhra Ghats

- g. Andhra Ghats North
 - (i) Kothagudem-Palavaram Region
 - (ii) The Krishna Tract
- b. Andhra Ghats South
 - (i) The Western Arch
 - (ii) The Cuddapah Basin or Nandyal Valley
 - (iii) The Eastern Arch

The plateau chiefly comprises of two major administrative units, Telangana and Rayalaseema, which differ from each other in several ways. The amount of rainfall in Rayalaseema is much lower than Telangana. This is reflected in the cropping patterns, population density, size and spacing of settlements, industrial struc-

tures and general economic conditions of the two areas. The eastern parts of both the above noted political units alongwith the adjoining areas of coastal districts are occupied by the Andhra Ghats which represent a geographical entity.

The northern and northeastern margin of Telangana is constituted by the *Central Godavari valley* which is distinct for its faulted structure, thick forest cover, abundant rainfall, sparse and tribal population, agricultural and industrial backwardness and poor means of transportation. The valley, also referred to as the Godavari trough, is further sub-divided into two third order regions—Central Godavari Valley West or *Adilabad Region* and *Central Godavari Valley East*, the demarcation line being a southward extension of the eastern limit of Adilabad district. The Central Godavari Valley East is strictly a narrow belt of very dense forests inhabited solely by tribal people having no urban settlements. The Central Godavari Valley West or Adilabad region, on the other hand, is a better developed rectangular block noted for cotton. It also contains a number of towns including Sirpur industrial centre. To the south of the Central Godavari Valley lies the *Telangana Peneplain* running upto the *Krishna valley* in the south and pierced by a tongue-shaped tableland on the west. It is a densely populated rolling plain with intervening graded streams. The northern portion of this peneplained area comprises the best agricultural lands of the Andhra Plateau and, accordingly, bears the highest population density in the region. But the southern part, mostly covering Mahbubnagar and Nalgonda districts, is agriculturally quite insignificant and hence sparsely peopled. This necessitates division of Telangana Peneplain into two third order regions, *Telangana Peneplain North* or *Warangal region* and *Telangana Peneplain South* or *Mahbubnagar-Nalgonda region*. Covering a major part of Hyderabad district, alongwith a few adjoining stretches in Mahbubnagar and Medak, there occurs an eastward projected tableland, the *Hyderabad Plateau*, conspicuous by its imposing position and laterite and lava deposits. The metropolitan economy of the eastern part of this plateau tract bears a good contrast to that of its

western counterpart which is marked by a desolate look. Hence it is further divided into two third order regions : *Hyderabad Plateau East* and *Hyderabad Plateau West*. The *Middle Krishna Valley* also forms a second order region of Telangana, being sub-divided into two units at a lower level. The *Middle Krishna Valley East* or *Nagarjuna region* may be distinguished from the rest of the Valley on account of its recent development due to the Nagarjunasagar project. The *Middle Krishna Valley West* or the *Krishna-Tungabhadra region* represents a level, fertile and highly populated tract with traditional economy.

The *Rayalaseema Uplands* is divided by the Penner into two second order regions—Rayalaseema Peneplain and Rayalaseema Plateau. The former, including most of Kurnool and western portion of Anantapur district, is a completely peneplained surface developed on the gneissic basement. Cash crops like groundnut, cotton and oilseeds dominate the agricultural scene. The northern part is more irrigated and level and has a higher population density as compared to its southern counterpart. Industrially too, the district of Kurnool is better developed, Adoni (69,951) being its most specialised and fast growing industrial town. As such, by taking the southern limit of Kurnool district as a demarcation line, Rayalaseema peneplain is conveniently divided into two third order regions, the *Rayalaseema Peneplain North* or *Adoni Region* and *Rayalaseema Peneplain South* or *Raydrug-Guntakal region*. The Rayalaseema Plateau is a vast tableland forming northward extension of the Karnataka plateau. The monotony of the plateau expanse is, however, broken by the narrow valleys of the Chitravati and Papaghni which are considered as the delimiting lines for its third order regions : the *Penner-Chitravati* or *Anantapur region*, the *Chitravati-Papaghni* or *Kadiri region* and *Chittoor region*. Though the entire Rayalaseema Plateau is a part of Chittoor district, the area falling to the east of the Papaghni is well connected and better served by the town of Chittoor (47,876). Similarly, the Penner-Chitravati and the Chitravati-Papaghni regions are chiefly served by the central places of Anantapur (52,280) and Kadiri (24,307) respectively.

The *Andhra Ghats* are divided into two second order regions, the *Andhra Ghats North* and the *Andhra Ghats South*, by the southern limit of the Krishna valley. The *Andhra Ghats North* is a narrow belt of detached hillocks which have been sufficiently subdued by the Godavari and Krishna systems. The southern half of this hilly tract is drained by a number of subsequent tributaries of the Krishna and thus may aptly be called the *Krishna Tract*. The homogeneity of the northern part, which falls in the Godavari basin, lies in its densely forested nature and primitive economy. However, a few urban centres like Kothagudem (69,728), the largest colliery centre of the Andhra Plateau, and Palavaram have developed; the whole region is strongly oriented towards these two towns and, as such, it may be called *Kothagudem-Palavaram region*. The *Andhra Ghats South* is a wide crescentic region full of continuous hill ranges and intervening river valleys. Due to these internal diversities the region is further sub-divided into three units : *the Western Arch, the Cuddapah Basin or Nandyal Valley* and the *Eastern Arch*. The *Western Arch*, consisting of the Seshachalam and Erramalai hills, is separated from the *Eastern Arch* of Nallamalai and Velikonda ranges by *Nandyal Valley*, carved out by river Kunderu but popularly named after the regional town of Nandyal (42,927). The *Eastern* and *Western Arches* are underdeveloped regions of the Andhra Plateau but the *Nandyal valley* is a developed and fertile tract.

Problems and Prospects

The undulating and rugged surfaces, poor and unreliable rainfall, very unevenly distributed forest resources, soil erosion, inadequate transport facilities and the monopoly of Hyderabad metropolitan area in modern developments have ren-

dered the Andhra Plateau a problem region of the Peninsular India. Agriculturally as well as industrially, the plateau is lagging much behind several of its neighbouring regions and a continuous overflow of its population to some big industrial centres may be observed. Whatever population the region is able to retain is characterised by low standards of living, illiteracy and poor health. All this has resulted into a number of internal troubles, the most noteworthy at present being the demand for a separate Telangana State. At least a separate Development Board for Telangana like the one for Rayalaseema would go a long way in removing regional disparities. But, at the same time, as the country itself is passing through a developing phase, the Andhra Plateau, too, offers wide scope for development activities and thus, a redress of its problems may well be contemplated. A few giant river projects like the Nagarjunasagar and Nizam Sagar are already at work. Several new ones may still be taken up as there is abundance of perennial streams. If the problem of water shortage is solved many of the agricultural troubles are bound to vanish. To get rid of the soil erosion the practice of afforestation and construction of *bunds* is called for. The region is rich in minerals, forest resources and a few agricultural products like groundnuts, oilseeds and cotton which offer a good scope for the growth of industries. A decentralisation of the centralised services and institutions at Hyderabad and incentives for the advancement of other centres may certainly check the undue influence of the metropolis over smaller urban centres. Thus, to conclude, one need not worry over the present problems which are a temporary phase; what is to be looked for involves a wise planning and continuous effort.

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The Tamilnadu Uplands and South Sahyadri region covers an area of 74,254 km² incorporating 53 taluks of Tamilnadu State and 12 taluks of Kerala (Fig. 25.1). It has more or less a rhomboidal shape bordered on the north-west and north by the Karnataka Plateau. In the west the Western Ghats run north-south with two prominent gaps, the Palghat and the Shencottah. On the whole, this region occupies a position of great importance in acting as a connecting link between the West Coast and the Coromandal Coast¹, yet its geographical isolation, mainly due to the girdle of mountains, has favoured the growth of distinct type of cultural landscape.

Historical Background

This region must have made a mark in the prehistoric times by virtue of its 'distinct civilization'.² It appears to have been occupied by human settlements very early and archaeological explorations and excavations have revealed the continuity of human existence in this area since Palaeolithic period. The discovery of Mesolithic tools in the Tirunelveli district establishes the early human occupancy and the traces of the Neolithic man are found in different parts of the Upland Region.³

The Tamilnadu in the fourth century B.C. known as *Tamilagam*, probably comprised the region between the Vengadam in the north, Cape Kumari (Comorin) in the south, and the two seas on the east and west. Thus it is evident that the present region was once a part of the then *Tamilagam*. The three kingdoms that dominated during the 'Sangam' period (the period of the Institutes of the literary academies held in the early Hindu period before the 1st century A.D.) were 'Chera', 'Chola' and 'Pandiya'.⁴ The boundaries

of these kingdoms varied as their power waxed or waned through their dynastic intrigues.⁵ In addition to these three kingdoms, there were a number of feudal chiefs under them such as the Ay of Podiyil, Peham of Kannamalai, Evi of Mutharu, Nalliyakkodu of Erumainadu and Adiyaman of Kongu Nadu.⁶ It is during this Sangam Age that a brisk commercial trade with Romans is said to have flourished through the chief ports of Chera, Chola and Pandiyan kingdoms.⁷ Relations between Tamilnadu and South East Asia probably go back far into the prehistoric period. Archaeological evidences show the cultural impact of Tamilnadu on Cambodia, Malaya and Indo-China even during A.D. 1st and 2nd centuries.

In the beginning of A.D. fourth century the Pallavas of north invaded this region and suppressed the three kingdoms. Further there was a never-ending feud between the Pallavas and the Gangas and the Chalukyas of north,⁸ which continued up to A.D. 575; the period between A.D. 300-575 is called by the historians as the 'Dark epoch'.⁹ However, during Pallava period trade and cultural exchange between Tamilnadu and South East Asia were well developed. Pallava script still has its impact over the script of S.E. Asia.

During the 'Sangam' Age the Region flourished both in commerce and trade. A number of settlements originated as centres of trade and administration. The existence of Roman coins in Madurai and Ramanathapuram districts further justifies the above statement. The towns like Kalinadia (Parri Nadu), Mullur (Malai Nadu) and Perur (Kongu Nadu) came into existence as the capitals of the various feudal kings. There are a number

ADMINISTRATIVE DIVISIONS
TAMILNADU UPLAND
8
SOUTH SAHYADRI

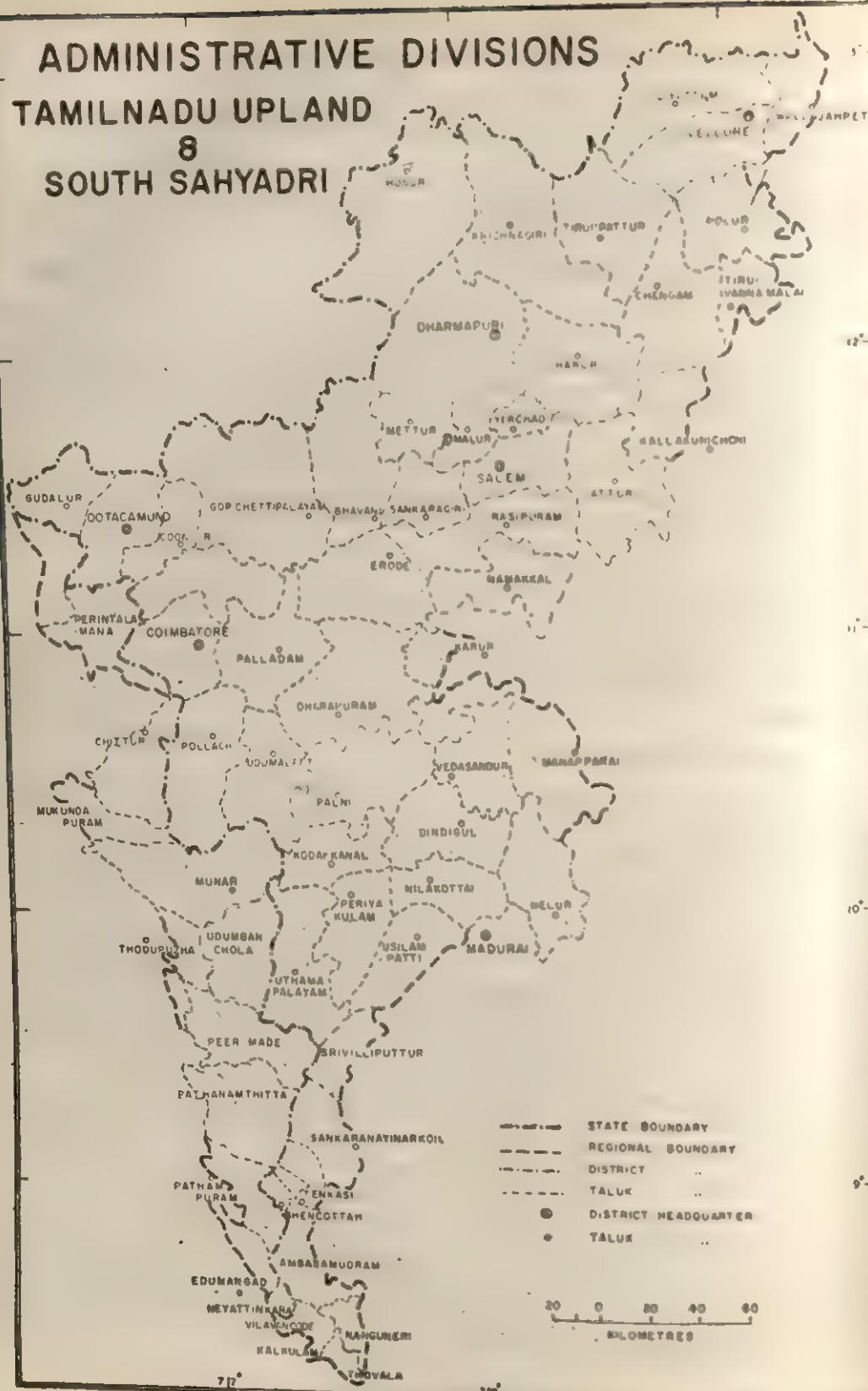


Fig. 25.1

of towns and villages mentioned in the Sangam literature but it is very difficult to identify them since in the Sangam literature there are "more place names in the same name and often there is a conflict of the probabilities and possibilities."

The influence of Pallava regime (7th and 8th centuries) is not so significant in the upland region because their headquarters was stationed at Kanchi (Conjeevaram) in the plains. However, the Pallava culture has its impact in North Arcot district (Mahendravadi village).

During the Middle Hindu period (850-1300), the temple was a centre of social life and further it became the nucleus of human settlement. Even later Chera, Chola and Pandiya kings took more interest in the construction of temples. Throughout the upland region there were urban and rural residential or trade centres of various size. Larger towns were called as *Perur* and the villages as *Sirur*; the suburban areas in cities were known as *pakkam* and collection of houses as *cheris*.¹⁰ Most of the places were connected by simple roads. Coimbatore, Salem, Dharmapuri, Namakkal, Tiruchengode, Kangayam, Bhavani, Rasiapuram and Erode towns appear to have their origin as temple towns during A. D. 900-1186.¹¹ During Vijayanagar rule, a number of forts and temples were constructed which became the nuclei of human habitations like Vellore, Krishnagiri, Dindigul and Nillakkottai, etc.

During the Muslim rule (1650-1800) northern and north-western parts of the Tamilnadu Uplands became the centre of attraction. The Muslim rulers spent much of their time in building new towns and renovating the old ones and a number of sites such as Anwaradabath, Suliyabath, Manubath and Abudullapuram (North Arcot) were selected for Muslim habitations. During the later part of the period this region faced the struggle between the Muslim rulers and the British. In fact, the northern part of Tamilnadu Uplands and north-western Nilgiris were made 'a score of incessant marches and counter-marches, advances and retreats, by the British and Mysore troops'.¹² Communication lines and habitation sites were heavily damaged during the wars. The towns like Erode, Sathyamangalam and Hosur

were almost deserted and ruined in 1790. Administration and the economy both were disrupted due to the impact of such wars.

The British period (1800-1947) witnessed the rise and growth of urban centres, development of transport and communications (both railway and roadway), administrative bureaucracy, adjustments in the administrative boundaries of taluks and districts, establishment of hill stations and cantonments, introduction of many educational institutions and medical facilities, irrigation and power developments (Papanasam, Pykara, Mettur Dam, etc.), and the introduction of tea and other plantation crops in the hilly regions (Nilgiris and South Sahyadri Hills).

During 1953-56 the States of Tamilnadu, Andhra Pradesh and Kerala came into existence by readjusting the boundaries of Madras Presidency with the neighbouring regions on the linguistic basis. As a result the Tamilnadu Uplands and South Sahyadri region forms parts of Tamilnadu and Kerala.

The Physical Setting

The general relief of the region (Fig. 25.2) clearly depicts the vast upland character studded with remnants of the Ghats.¹³ It is indeed a part of the great tableland which stretches from Cape Comorin in the south to the Satpuras in the north. The Cauvery, with its tributaries, and other rivers have much diversified the terrain. One can recognise two distinct areas: one formed by tectonic-cum-erosional processes and the other by the erosional activities of the Cauvery and other rivers. The former includes the North-Western hilly region and South Sahyadri hills while the latter the Tamilnadu Hills, Coimbatore-Madurai Uplands and Middle Cauvery valley.

The north-western hilly region comprises the Nilgiris in the west and the Balaghat in the north. The Nilgiris form a compact plateau of about 2,560 km², with a summit level of 1,800 to 2,400 m rising with extreme abruptness on all sides.¹⁴ The prominent high peaks are Doda Betta (2,637 m) and Makurti (2,554 m). In the north, the Nilgiris are cut off from Mysore plateau (900-1,200m) by the 'deep straight gash of the Moyar'. This

massif is skirted by the Moyar in the north and the Bhavani in the south; the Malabar rivers, though shorter, have obviously captured the head waters of these streams.¹⁵ The Balaghat where the Ghats have been reduced much in elevation and which appears as a continuation of the Mysore tableland, comprises the major portion of the Hosur taluk and part of the Krishnagiri taluk of Dharmapuri district. This portion is broken by an interminable series of undulations,¹⁶ some being almost too steep, and others more gentle in their slopes. The approach to the Ghats from the plateau is marked by a scattered chain of hillocks clothed with scrub jungles.

The Eastern Ghats meet the Western Ghats in a knot in Nilgiris district. The continuity of

the Sahyadri is broken by the Palghat gap. South of this gap the Ghats rise once again to form the Anaimalai Hills and an eastern offshoot of which forms the Palani Hills; further south are the Cardamoms, Varushnad hills being the main offshoot. The Ghats, rising 1,800 to 2,100 m, show a general NNW-SSE trend, varying to NW-SE further east. These hills are more complex than the Nilgiris and have the highest peak of South India at Anaimudi (2,695 m). The longitudinal straight stretches of the rivers (like the Periyar) clearly suggest structural control in this area. Between 10°N and the Shencottah gap the active streams of the exposed Arabian Sea front have pushed the watershed back to within 6 to 8 km of the eastern edge of the hills.¹⁷

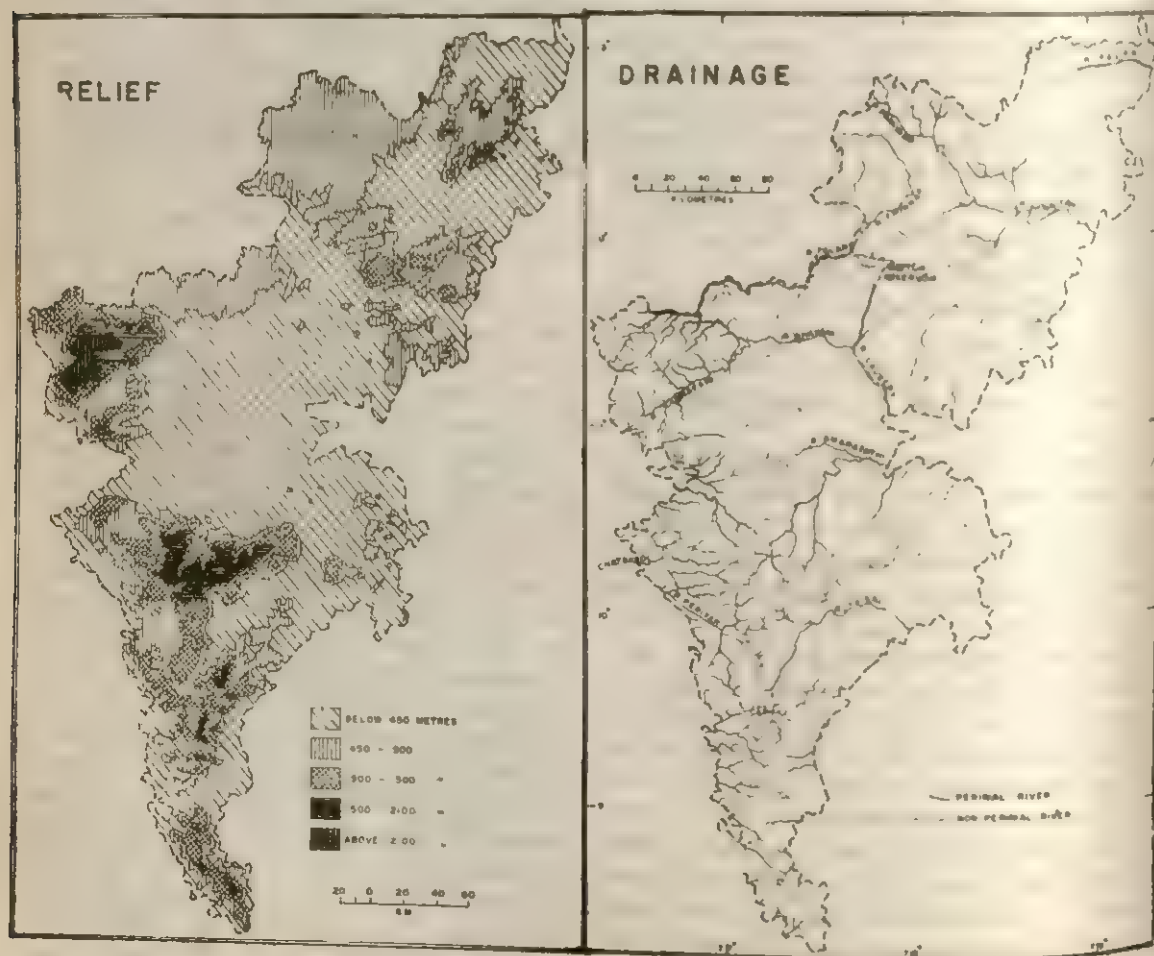


Fig. 25.2

The Southern Sahyadri Hills are dotted with falls.

The north-eastern plain between the Palar and the Cauvery rivers is backed by discontinuous line of highland, made up of small but bold hill masses. Notable among these masses are the Javadis, the Shevaroyes, the Kalrayans and the Pachamalais, which are collectively known as Tamilnad Hills. The Shevaroyes spread over an area of 250 km², rising to 1,525-1,647 m in elevation. Javadis is limited to an elevation of 1,098-1,160 m while Bhavanimalai rises to 1,260 m.

Towards the north west of the Tamilnad Hills lies an upland which is the extension of Mysore Plateau. The elevation varies from 305 to 710 m.¹⁸ To the west of Dharmapuri and Krishnagiri taluks, below the main Ghat steps, lies a shelf (455-685 m), while on the north eastern side, the Palar valley widens out and falls below 300 m.

The Coimbatore upland rises gradually from 122-183 m along the Cauvery to 366-457 m in the west. It has a crescentic shape with gradual slope towards the interior. Here the insignificant watershed between the Noyil river in the north and the Amaravati in the south is remarkable. Though such is the general configuration of the land, the region is interrupted here and there by "local oscillation of level and small hillocks"¹⁹ such as Chennimalai at Erode. In between Coimbatore and the Anaimalais, there is the broad Palghat gap cut across the western Ghats by a river of a former geological epoch,²⁰ linking up the Malabar coast with the upland.

The Southern region extends almost upto the foot of the Western Ghats with minor elevations here and there as in the Valanad Hills. The parts of the Vaigai and the Tambraparani basins occupy important position in this region. The general slope of this area is towards the east. The Vaigai itself thrusts great wedges of alluvium up between the hills and down to form the Ramnathapuram Peninsula.²¹ The Madurai hills appear to be a continuation of the Varushnad and Andipatti ranges from which they are separated by the Vaigai valley.

The elevation of the Cauvery valley is not more

than 300 m. The continuity of the Eastern Ghats is broken by the central Cauvery basin into the Kollimalais and the Pachamalais in the north and the Madurai Hills (Vinamalai) in the spurs of the Pachamalais which project into the Tiruchchirappalli district²². The spurs rise to a maximum elevation of 534 m. This valley has attracted human settlements from ancient times²³.

Geology

A comprehensive study of the geological formations since Archaean period by Rao²⁴ reveals the fact that the entire Tamilnadu Upland and South Sahyadri hills have undergone lesser changes as compared to the coastal region of the Indian Peninsula. The major portion of the region is covered with gneissic formation (Fig. 25.3). North of the Palar river, the gneisses are mostly granitoid in character giving rise to rounded hills and characteristic granitic topography. In southern parts they are micaceous and possibly hornblendic in character. The charnockites are found extensively in the region south of the Palar, forming the Javadis, Shevaroyes etc. and also in greater part of the Nilgiris. They generally form plateau-like masses with a gently undulating surface, a feature which is suited for the formation of lakes like the Kodaikanal, Yercaud, etc.²⁵ Crystalline limestone of fine quality outcrops on the ridges at Madukkarai (11 km south-west of Coimbatore).

The hornblende schist, amphibolite and haematite quartzite with bands of limestone and chloritic schists of north-western portion of North Arcot, kyanite, quartz and schist of Satyamangalam and magnetite-haematite and quartz schists of Kanjamalai Hills (Salem)—are all considered to represent the typical Archaean (Dharwarian) exposures of Tamilnadu. The Archaean gneisses and schists have been intruded by dykes of the Cuddapah system because of the prevalence of volcanic activity in this period. These dykes weather more slowly than the surrounding gneisses and hence they stand as wall-like ridges in northern part of the area (North Arcot). The alluvial formations are found in the eastern part of the upland region along the river courses.

The Sahyadri Hills, according to one section of geologists might have been formed due to block movements in recent times. Almost all the stupendous mountainous ranges of the region like Nilgiris, the Shevaroy, the Palanis, the Anaimalais and the Cardamom Hills are representative of fault scarp mountains.

Drainage

In contrast to the Himalayan rivers, most of the rivers of the region are mature and have almost baselevelled the land.²⁶ With the exception of the Ponnani, Periyar, Kodayar and Pazhayar

the trend of the rivers in the upland region is from west to east down to the Bay of Bengal (Fig. 25.2). The Cauvery, the Palar, the Vaigai, the Tambraparani and the Periyar form main river systems; a few others like the Vellar, Vaippar, Ponnar, Kodaliyar in the north and west may also be noted. Traversing across the region is the Cauvery which, being fed by both the monsoons is practically perennial. The other perennial rivers are the Tambraparani in the south and Periyar and Ponnar in the west. All the other rivers remain dry for a good period in the year and even during the rains the discharge depends

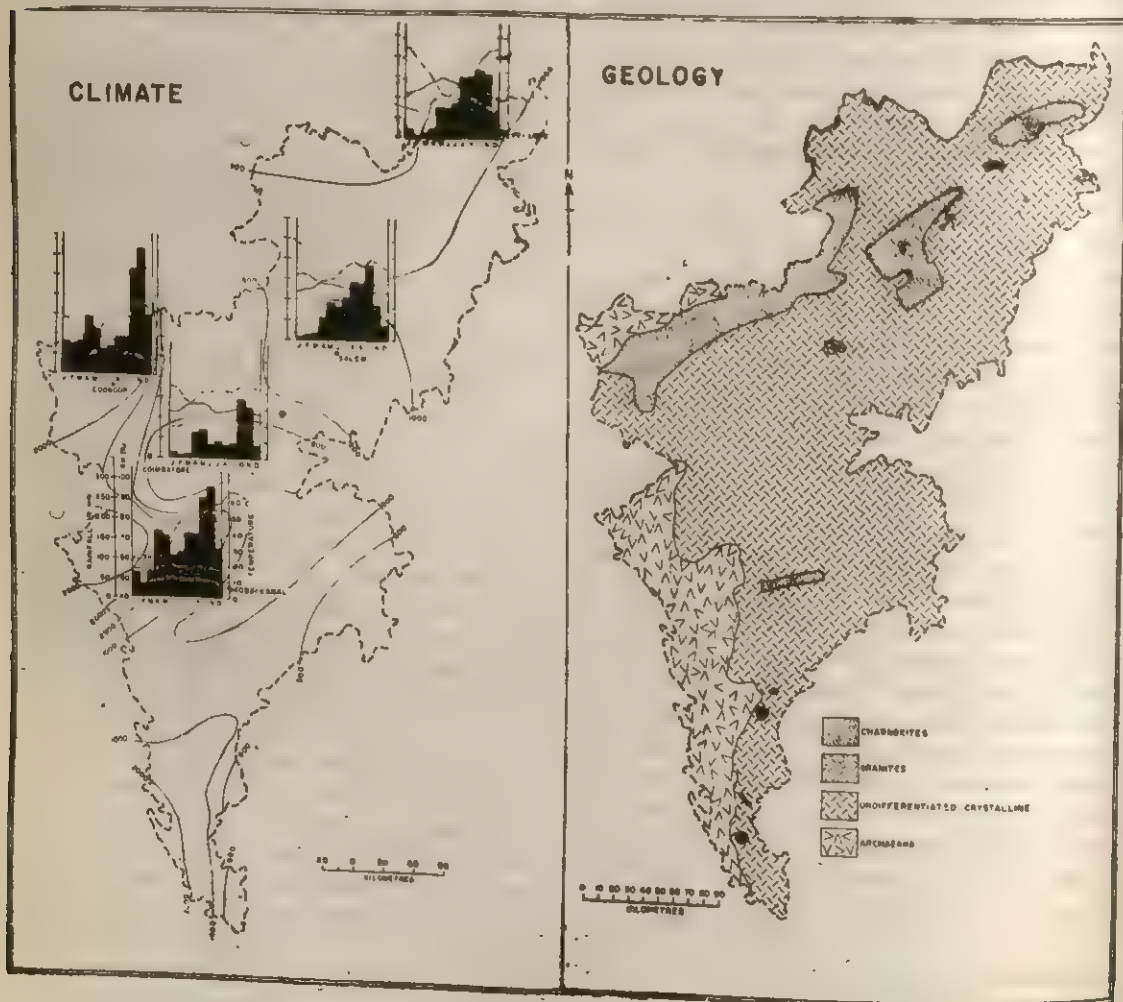


Fig. 25.3

on the character and amount of rainfall and extent of catchment and as such most of them are not suitable for the development of power and major irrigation works. The western flanks of the Sahyadri are dotted with falls, which have sufficient potential for hydel power. The flanks of the fault-oriented valleys are marked by transverse gorges producing trellis pattern.²⁷

The north-south courses of the rivers in the Sahyadri reflect structural control. The southward flow of the Palar and Ponnaiyar follows strike direction, while the Cauvery flowing south-east is transverse to the foliation direction. Most of the rivers follow characteristic fault planes for miles. The Konalar is a small meandering stream on the upper Palani Hills, having formed ox-bow lakes and cut-outs in its valley.

The drainage pattern of the Upland region is probably due to the easterly tilt of the Peninsula and the uplift of the Western Ghats in the Tertiary period, while the flow of the rivers is mostly adjusted to the structural features.

Climate

In this region the climatic influences are persistent, often obdurate in their control and have caused several times seasonal adverse conditions as in N and S Arcot in 1947-48. The main controlling factors are its tropical location, relief and proximity to the seas. The western flanks of the South Sahyadri experience a different climate due to the direct influence of south-west monsoon, whereas on the eastern side (the upland), the influence of retreating monsoon is more pronounced. However, by situation, the climate is tropical, but unlike North India, the summers are not too hot, nor winters are so cold. The influence of Bay in the east the existence of the Palghat gap and the influence of Arabian Sea on the west have always played a significant role in controlling the climatic conditions of the Region.

Temperature : The lowest mean monthly temperatures are reached in December (13.4°C at Vellore to 16.0°C at Salem) while the absolute minimum occurs in January (2.2°C at Ootacamund to 9.3°C at Pamban).²⁸ However, at a number of places on the South Sahyadri Hills the

minimum occurs between 2°C to 6°C (Anaimalai Hills).

The highest mean monthly maximum reaches upto 23.9°C at Tiruchchirappalli (outside the upland region) and the minimum at Ootacamund (0.9°C). The highest annual mean temperature zone includes primarily Madurai and part of Tiruchchirappalli district (above 14.6°C). On the whole the upland region (except the Nilgiris and the South Sahyadri Hills) experiences an annual mean temperature of more than 12.4°C (Fig. 25.3).

Rainfall : There are two distinct rainfall zones : (i) the Upland tract and (ii) the Nilgiris and South Sahyadri Hills. The rainfall increases sharply from the Tamilnadu Upland (600 mm) to the South Sahyadri Hills (2,000 mm). Towards the western flanks of the South Sahyadri the rainfall is much higher due to the south-west monsoon (1,500 to 2,200 mm). Near the Shenkottah gap and the south Wynad region the rainfall is maximum (2,000-3,000 mm). The lowest rainfall (below 1,000 mm) occurs in Devikulam Taluk. In fact, there is decrease in the amount of rainfall from north to south.

The rainfall is fairly widespread throughout the year in the upland region; most of it occurs during October-November. There is more rainfall in October in Coimbatore, Madurai and Northern plateau region. The northern part of Tamilnadu Upland (Nilgiris, Salem, North Arcot) has more rainfall during the advancing monsoon, while the southern part (Coimbatore, Madurai, Ramanathapuram, Tirunelveli) during the retreating monsoon period.

Apart from this, copious post-monsoon (north-east monsoon) rains occur over the upland region when the depressions or cyclonic storms move westwards and strike the Coromandal coast. The uncertainty or variability of the retreating monsoon rainfall of Tamilnadu Upland is the reflection of the uncertainty or variability in the occurrence of depressions and cyclonic storms and their direction of movement. The regions lying close to the gaps (Palghat and Shencottah) are favourably situated with respect to the south-west monsoon winds. Here the June-

July rain is a continuation of the hot weather rains and hence there is no second half of June minimum, characteristic of Tamilnadu Upland elsewhere.

Hot Weather Season (mid-February to mid-June)²⁹ is generally fine interrupted occasionally by thunderstorms, which are due to instability caused by the inflowing air from the sea. Rain-fall is widespread.

South West Monsoon (mid-June to mid-October): On the windward side of the Ghats the rainfall is maximum (1,000 to 2,000 mm), whereas on the leeward side there is little rain (less than 600 mm); Javadis and Shevaroyis which lie in the track of the winds through the Palghat gap receive the heaviest rainfall of the season (more than 1,200 mm). Towards the months of September and the first half of October, the winds weaken giving place to calms and then gradually to the easterlies.

The Retreating Monsoon Season (mid-October to mid-December): During this season the cyclones originating from the Bay affect southeastern uplands and cause heavy rains, (400-600 mm in Madurai). After the middle of December, a dry fine weather prevails throughout the Region.

The Cold Weather Season (mid-December to mid-February): In this season, the temperature increases from north to south (9.7° C at Vellore to 11.8° C at Madurai and 12.7° C at Palayamcottai.) A fine dry weather with warm days and cold nights is observed during this period.

According to Ramamurthy³⁰ the rainfall in any district of this region does not go below about one-seventh of the normal in even the worst drought period and would not exceed two and a half times the normal in any district during the year of highest floods.

Natural Vegetation

The region has more than 4,500 species of flowering plants. The rainfall of this region is the major determining factor of the growth of natural vegetation.

Both on the Nilgiris and South Sahyadri Hills, the vegetative cover is very thick with monsoon forests prevailing almost all over. The true

evergreen forest is found along the south Sahyadri (455-1,370 m). Notable species found in the hilly region are *Albizgia odoratissima*, rose wood, *Hardwick binata*, *Phyllanthus emblica* (nelli), sandalwood and teak. The other huge trees are bastard sago and *Calophyllum tomentosum*. On most of the Upland region the forest cover is practically non-existent. The common plants that are grown here are Agathi, *Styphnolobos tomica* (elli), coconut, areca, palmyra, jack, mango, banyan, *Longifolia* (illupai), *peepal*, wattle, acacia etc. Apart from this, scattered woodland and scrub and bushlands are found in the northern upland region.

Soils

The loamy and clayey soils are found in the valleys and depressions. The red and sandy varieties, commonly found in the northern part of the Cauvery valley are either the product of the weathering of the local rocks or have been transported³¹. The loamy and clayey nature is due to the holding up of oxidation process in depressions and hollows (Fig. 25.4).

Thin red soil is found in the Coimbatore district, Dindigul and Palani Taluks (Madurai). Here the rainfall is low and the weathering has not kept pace with the erosion of the surface soil cover. As a consequence the soil cover is extremely thin, and there is scarcity of vegetation in this area. However, the soil is rich in potash, lime and magnesia due to the "hornblende nature of the gneiss". A pocket of black soil is also found in the area covering the taluks of Palladam, Pollachi and Udumalpet.

The black cotton soil is found in the southern part covering Tirumangalam, Sattur, part of Sankaranaiyarkoil taluks. This is mainly due to weathering of "ferruginous gneisses and schists under semi-arid climate". It ploughs itself under the alternating process of contraction and expansion. Surface materials are carried deep into soil through the cracks by wind and water, resulting in the mixing of soil.

At the foot of the South Sahyadri deep red loam soil is noticed. This is a fluvial deposit washed down from the adjacent Ghats.³² Water penetra-

tes very easily in this soil and thus the soil climate is humid. Further, it may be pointed out that since this area receives more rainfall than the upland tract, the oxidation is rapid and hence the soils of deep red colour have developed. Since water is obtainable at lesser depth, well irrigation is common. The alluvium soil is found in the Cauvery and Tambraparani valleys.

Lateritic soil is observed in the Nilgiri Hills and parts of Palani and Anaimalai Hills. It is a mottled red or brown coloured scoriaceous soil. The soil is essentially a mixture of hydrated oxides of aluminium and iron. It is a popular building stone in the western South Sahyadri and is also used as road metal.

At high altitude (above 600 m) on the South Sahyadri forest soils are found. They are characterised by a surface layer of organic matter derived from the forest growth. Plantation crops like tea, cardamom, rubber etc. thrive well in this soil.

Mineral Resources

Iron Ores occur in several parts of Salem, Tiruchirappalli and South Arcot. They are in the form of magnetite quartzites and the iron content is not more than 40%. The reserves in Salem district is estimated at about 300 million tons. The Salem region has easy accessibility to cheap power, water and a number of contributory materials

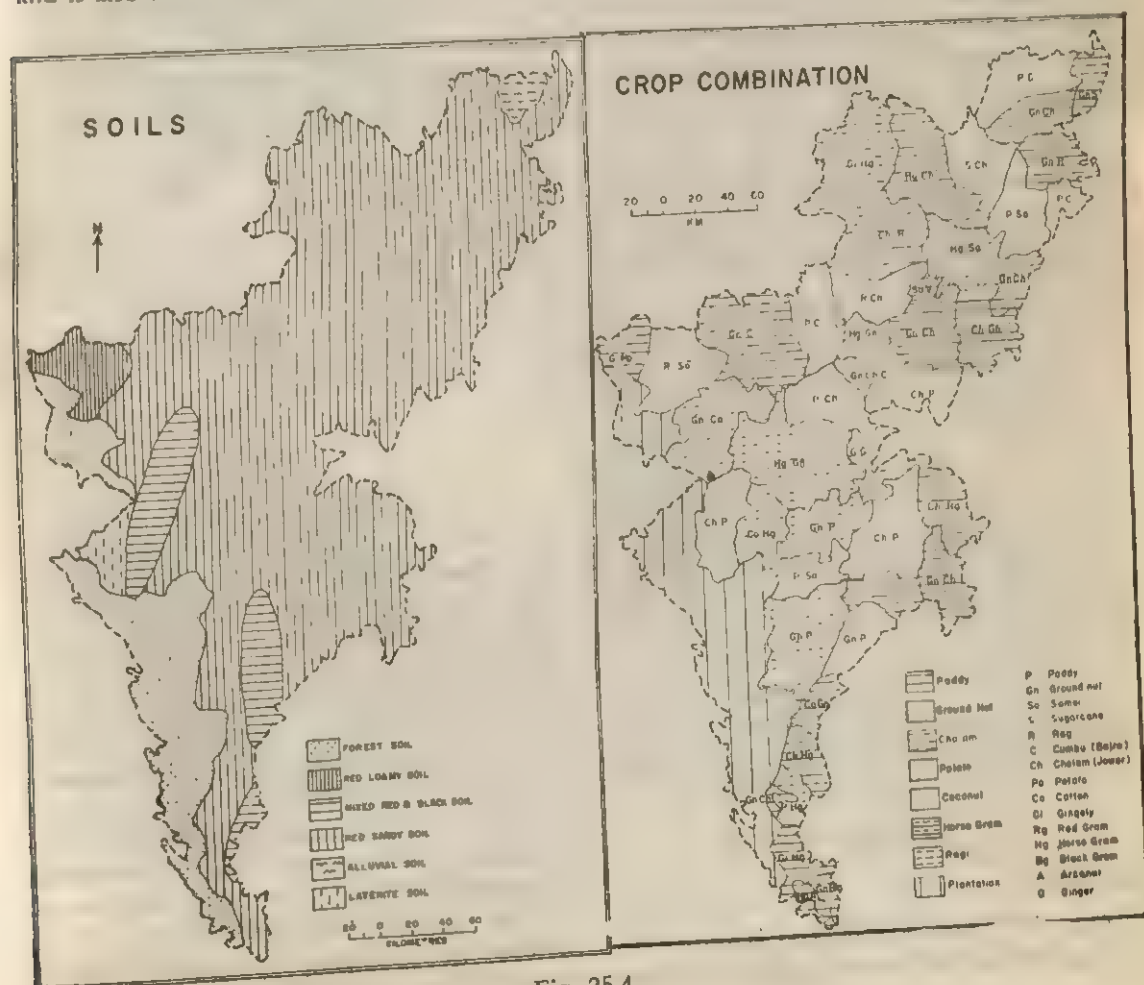


Fig. 25.4

like magnesite, chromite, quartz, bauxite, limestone and dolomite. Apart from this iron ore is also available in the Nilgiris and Erode.

Magnesite : The region accounts for 90% of the total production of magnesite in the whole country.⁸⁸ At present, magnesite is utilised for the production of refractories. This ore is available mainly in Salem district. *Bauxite* occurs on some of the highest peaks in the Shevaroy Hills. It is estimated that the average contents are 45 to 50% aluminium, about 30% ferric oxide, 5 to 6% Silica and 25% water. The reserves are estimated between 7 to 8 million tons.

Beryl is available in Salem and Coimbatore. It is also available in the South Sahyadri Hills just north of the Anaimalai. It is of a peculiar translucent sea-green colour. *Corundum* is concentrated in a narrow zone embracing south of Salem district and Erode taluk. A small mine also occurs in Dharmapuri taluk. This mineral is in great demand as an abrading agent in metal work and stone cutting. *Red garnets* are found in the crystalline metamorphic rocks in Sankaridrug (Salem).

Zinc stone is available in the Nilgiris, Coimbatore-Madurai uplands, Ambasamudram taluk and on the western flank of South Sahyadri. High grade limestone is available near Annadapattai (Salem) and is suitable for the manufacture of bleaching powder. Towards the east of this area, the limestones are dolomitic in composition and are therefore suitable for basic lining in the steel furnaces. Apart from the above minerals, considerable amount of mica (Mettur, Gudalur, Dindigul and Ambasamudram taluks), limonite (Coonoor and Dindigul taluks), chromite (Rasipuram and Salem taluks), gold (Gudalur and Sathyamangalam taluks), graphite (Ambasamudram taluk), pyrites (Gudalur) and steatite (Salem) are also available in the Region.

The Cultural Setting

Population

Out of 15.7 million (1961) population, 79.50% is rural, slightly higher than that of Tamilnadu

State (79.39%). Excepting the South Sahyadri hills and Nilgiris, the distribution of population is generally even; however, micro level regional variations in accordance with the rainfall, soil, drainage and irrigation facilities are significant as in the southern part of the region the concentration is more towards the South Sahyadri with the increasing rainfall from the coast to the Ghats (700 mm to 2000 mm). In the Coimbatore-Madurai Upland its concentration is higher in the areas with level topography and fertile soil, whereas in the northern part of Western Ghats, even though the rainfall is more, the population is scattered mainly due to its rugged topography (Fig. 25.5). On the whole, over 60% of population is confined to the Coimbatore-Madurai Upland.

The average density of population (212 persons per km²) is less than Tamilnadu State average (258) but it is well above the Indian average. The density ranges from less than 100 in 4 pockets (Yercaud, Gudalur, Kodaikanal and Devikulam taluks) which are hilly and forested, to over 500 (Salem, Coimbatore and Kalkulam) which have the impact of larger urban centres. In southern portions of the region (except in the main Sahyadri range), the Cauvery valley between Coimbatore and Salem and Palar basin around Vellore show a high degree of concentration (300-400) owing to fertile soil and high degree of urbanization.

The average density (200 to 300) zone covers in general the central part of the region in two main blocks, one around Coimbatore and the other extending from around Salem to the border of Srivilliputtur. The scattered patches are around Vellore and in parts of Tirunelveli. The rugged tract of South Sahyadri (Thodupuzha, Wynad, Pathanamthitta etc. taluks of Kerala and Udumalpet, Palni of Tamilnadu) and Polur and Changanam (North Arcot), Harur, Krishna giri, Dharmapuri, Attur and Hosur (Salem), Bhavani, Gopichettipalayam (Coimbatore) and Kallakurichchi (S. Arcot), all being parts of the Tamilnadu Ghats bear a density of 100-200 which mainly owes to their ruggedness and relative dryness.

There are 4,188 villages of which 107 belong to Kerala State. On an average, the Kerala

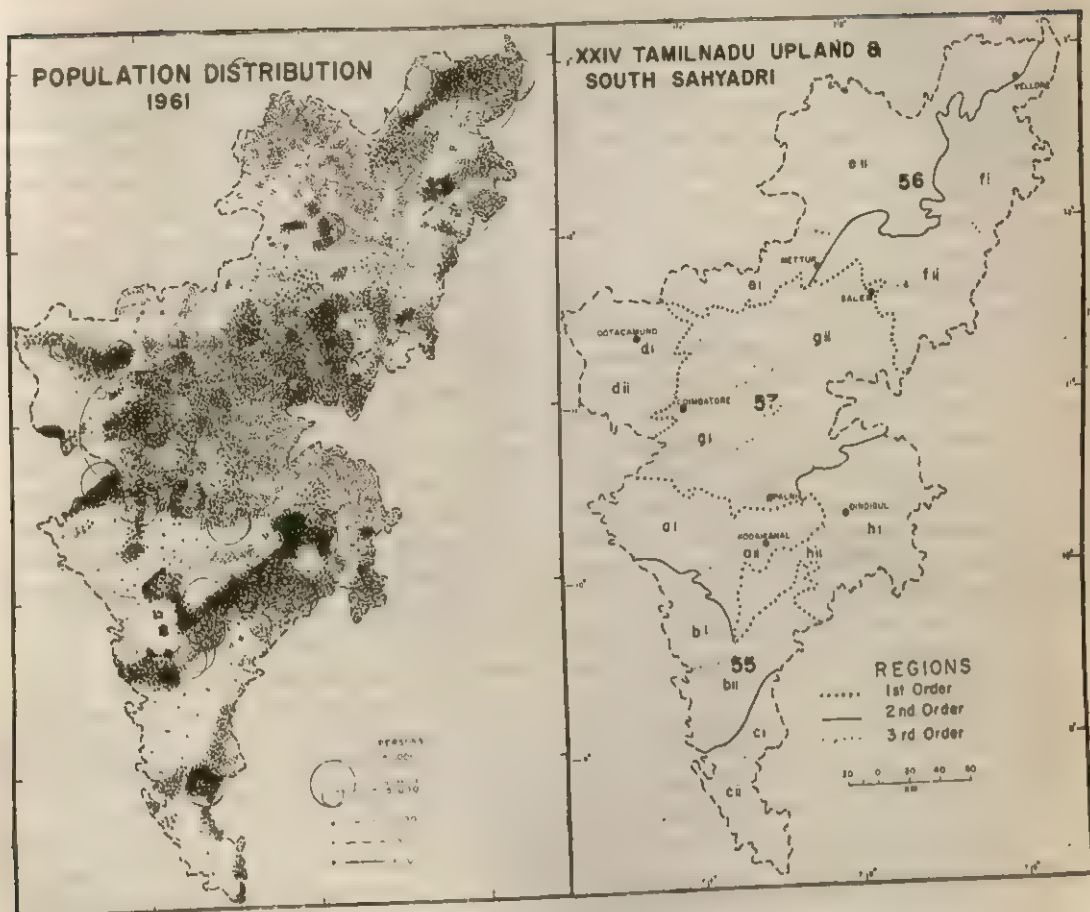


Fig. 25.5

village has a population of 12,627 persons whereas the Tamilnadu village shows a figure of only 2,858 persons. The average rural density of the region is 168 per km² varying from below 100 to 500. The high rural density region (300 and above) covers all the taluks of Kanyakumari and adjoining Nedumangadu of Trivandrum and parts of Salem, Omalur, Sankaragiri, Thiruchencode and Rasipuram (Salem district). In the Kanyakumari-Trivandrum area it exceeds 500 corresponding with high rainfall and fertile soils. The net sown area in Kanyakumari district is 94.2%, the highest in the State. The high density in Salem and adjoining areas can also be attributed to the high intensity of cultivation (81.9%). Gudalur, Devikulam and Kodaikanal form a low density zone

(less than 100 persons/km²), being hilly and unsuitable for cultivation.

There is one marked difference between the distribution of general density and the rural density in the Coimbatore and Vellore areas which exhibit a high total density as compared to rural density. This is mainly due to the development of industries in these areas.

The agricultural density is considerably low in the Agastiyamalai and Vellore region, while Nilgiris and parts of Coimbatore upland and Devikulam taluk have high agricultural density. In terms of physiological density, the Nilgiris, western portion of South Sahyadri hills and Kodaikanal taluk (Palni Hills) show high density reflecting high pressure on the land due to

the hilly topography. Only 33% of the total land in the Nilgiris is under cultivation and only 16% in Kodaikanal taluk.

Trend of Population Growth : There is a general increase of population in all parts of the region, recording over 90% during 1901-61, which is higher than that of Tamilnadu State (74.97). It varies from below 60% (parts of Tiruchchirappalli and Ramanathapuram) to over 200% (Nilgiris and parts of S. Sahyadri). The districts of Coimbatore (92.88), Salem (91.84), North Arcot (82.7) and Madurai (88.95), constituting major part of the Region, have recorded a near average growth. The overall trend of spatial variation reflects the mobilization of people towards the hitherto neglected areas. A significant feature of the growth is the increase in all the decades though it fluctuated between about 5% (1911-21) to over 16% (1941-51). It is notable that the decade of maximum growth (1951-61) throughout the country has been of little significance in the region with a percentage increase of less than 12. Further, there had hardly been appreciable decline in any of the districts even during the periods of country-wide decrease in population. During 1901-21, the average increase was about 14% (0.7% per annum). It has been high (20-30%) in Vellore and Gopichettipalayam regions and over 30% in Agastiyamalai.

In the next three decades (1921-51) the increase of population (1.7% per annum) was appreciably higher than the previous two decades. Sub-regionally, the increase was only 1.31% in the Tamilnadu Ghats and Coimbatore-Madurai Upland while in South Sahyadri it was 2.4%. The highest percentage increase (5.8% per annum) is recorded in Ootacamund taluk (Nilgiris) followed by Thódupuzha (about 2%).

The highest percentage increase in 1931-61 was recorded in the Nilgiri district : Ootacamund (189.0%), Coonoor (121.0%) and Gudalur (107.0%) taluks gained appreciably. The implementation of the three Five Year Plans which have induced the growth of power generation (Pykara and Kunda Projects) and industrialisation (Hindustan Photo Films, Cordite, Needle and Tea Factories) in this district acted as pivots

in attracting a large number of people from outside. The high increase in Coimbatore taluk (127%) is mainly due to the growth of cotton textile industries. The low percentage increase in Dharmapuri (19.2%) in Salem and Dharmaparam (13.5%) in Coimbatore might be due to the emigration of labour force towards Vellore, Ranipet, Salem and Coimbatore towns as agriculture in these dry tracts of Tamilnadu Upland (less than 650 mm of rainfall) is not prosperous.

Occupational Structure : Over 47% of the population constitutes the working force which is higher in rural (49.8%) than in urban areas (33.8). Further, the working force is higher among males (59.7%) than among female (31.3). Agriculture, however, engages the maximum workers (58.27%) followed by other services (17), household industry (9.13), manufacturing (5.17), trade and commerce (4.56) and mining, plantation, etc., (3.46). In the Tamilnadu Ghats, agriculture (68%) is more significant although mining and plantation (3.61) are also notable. Agricultural employment accounts for only 48% in South Sahyadri where household industry is quite important (16.52%). Plantation group (4.57) and manufacturing (4.37) are also remarkable. Even in the Coimbatore-Madurai Upland agriculture is not so dominant (54.27%); the household industry (9.57%) is, however, more significant here than in the Tamilnadu Ghats. The ratio of female workers is generally high in the agricultural sector, particularly in the Nilgiri district and the western flanks of the South Sahyadri. In non-agricultural sector Coimbatore district occupies the first place in the participation of women (48.9%) followed by Salem (48.7%) and Madurai (47.6%).

Urban Population : 20.5% of the total population is urban. The South Sahyadri of Kerala with only Chittur town is practically devoid of urban population. The urban population is distributed in 99 towns of the Region. There are six class I and 10 class II cities and 28 class III and 29 class IV towns. Over one-fourth of the urban centres are small (below 10,000).

There was appreciable increase (25.3%) in the urban population of the Region during 1901-11

but in the next decade the percentage increase was reduced to half due to the frequent occurrence of epidemics. The remarkable increase in urban population after 1941 obviously reflects the growth of industries and also the "growing tendency for people to settle in towns for various facilities such as employment, education, commerce and the amenities of town life." The areas of higher increase in urban population coincide with the industrial belt of the region. In general, the process of urbanization exhibits a pattern in which the rate of change is slow at first, then rises steeply as it enters the industrial era.

There are three linear zones of urban concentration: one between Nagercoil and Ambasamudram for about 64 km in Tambraparani basin and the other in between Ootacamund and Chittur covering Mettupalayam, Coimbatore and Pollachi towns and the third in between Walajapet-Gudiyattam. Urban agglomeration is also noticed around Salem, Erode and Tenkasi.

Rural Settlements

There are 4,188 villages of different sizes. About 41% of the total rural population lives in high medium sized villages (2,000-4,999), while only 0.26% resides in small villages (less than 200).

Overgrown villages (10,000 and above) account for about 1% of the total rural population. Kerala high land region, Kanyakumari, and Nilgiris record higher percentages in overgrown villages. Relief and arable land have played important role in the distribution of different size settlements. In Kalakurichi and Thanjavur taluks more than 50% of the rural population lives in small to medium sized villages.

In general, the settlements are compact to semi-compact in Tamilnadu Uplands (Fig. 25.6), whereas in the South Sanyadri they are semi-compact, tending to be linear on the valley slopes. In the Nilgiris the settlements are often small and hamleted. Apart from the topography, the rainfall also influences the distribution of settlements to some extent.

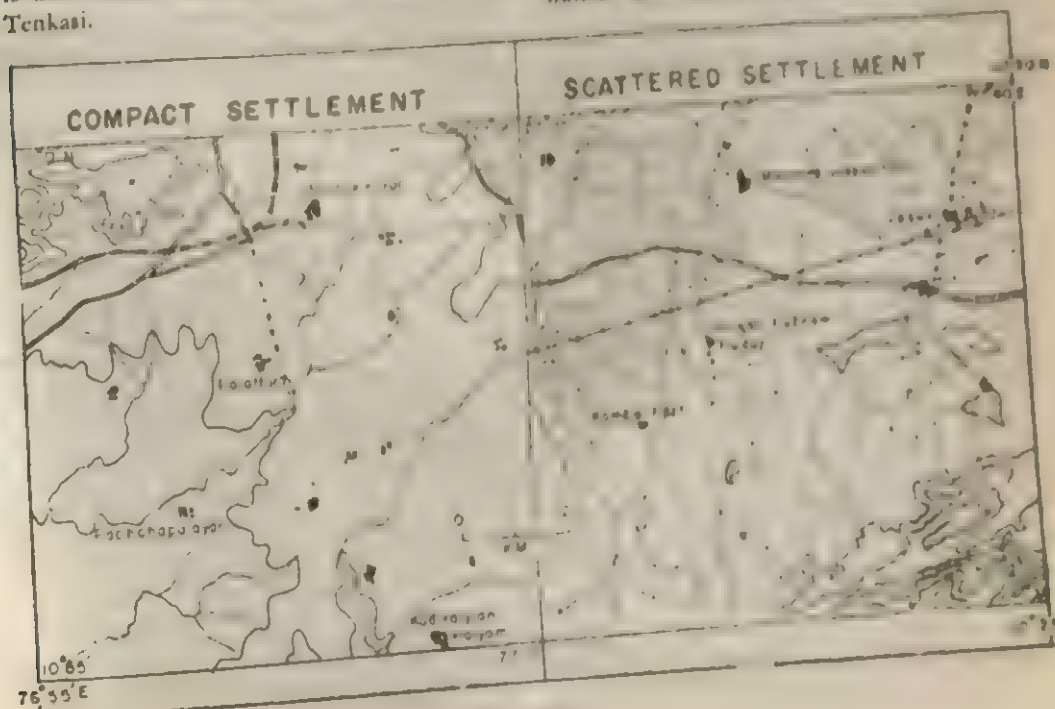


Fig. 25.6

example, the topography in the Agastiyamalai and Comorin Hilly Region is nearly the same as in the Pollachi taluk in between Coimbatore and Pollachi, yet the distribution pattern of settlements is not the same. The main causal factor is water : in the Kerala region with higher rainfall and evergreen forest generally the settlements avoid the flood-prone valley bottoms and dot the spurs and valley slopes though the people cultivate the valley lands, whereas in drier Pollachi area they are forced to settle in the valleys where they can get water from the wells.

The settlement pattern of the Nilgiris and plateau region can be studied through the sample villages. The villages in the Nilgiris show dispersed type of settlements; the people have constructed their houses on the slopes wherever a suitable space is available. A contrasting picture is exhibited by the village Devampadi of Pollachi taluk in Tamilnadu Plateau Region. (Fig. 25.7) The caste system plays an important role in the distribution of houses and clustering of settlements. The low caste people, *Harijans*, live away from the main settlements. The *Goundars* and *Boyers* live in separate blocks.

The caste system which played an important role in the distribution of houses in the plateau region had no importance in the hilly tracts since the houses sprinkle throughout the region.

The house types of hilly regions are different from those of upland regions. Most of the houses in the hilly tracts have tin-sheets and Mangalore tiles as roofing materials. Thatched roof is found at random. In the upland region, most of the houses have thatched roofs with palm or palmyra leaves. Because of the development of transport in the Nilgiris, the use of stones, bricks, etc. is increasing. In the Kodaikanal hills most of the houses have got tinsheets which can be easily transported by roads because of light weight.

Urban Settlements

In the Sangam era the towns originated as centres of trade and administration. During the middle Hindu period the temple was the nucleus of the urban habitat, but during the later Hindu period due to the frequent Muslim invasions defence became a more dominating factor and a number of towns came into existence with forts as nuclei. The Muslim period shows two broad

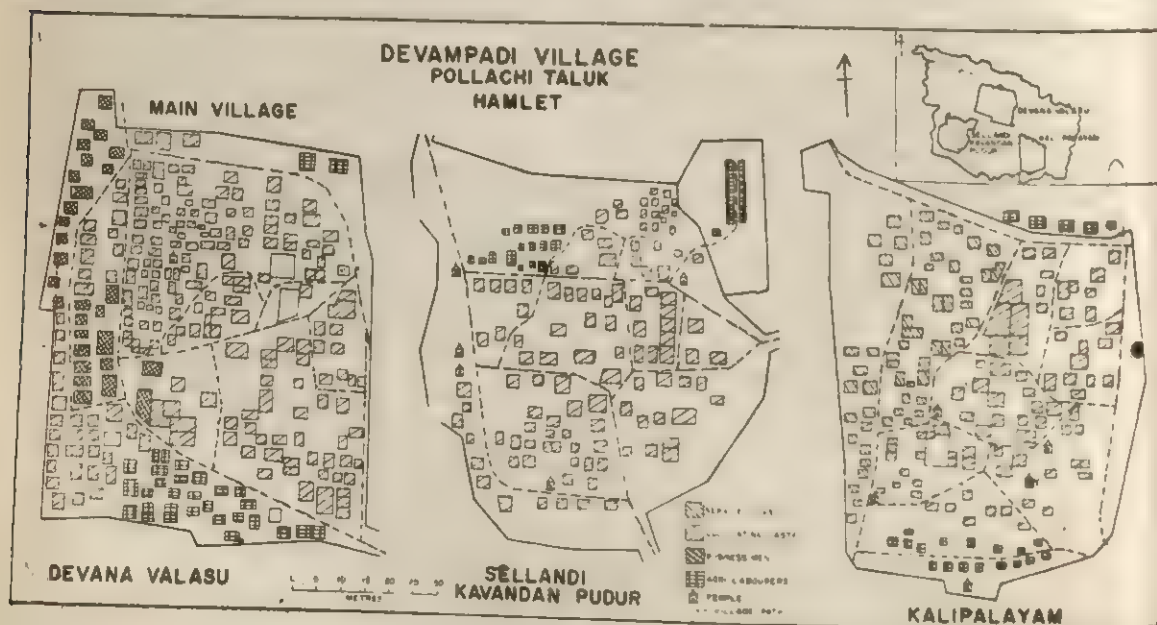


Fig. 25.7

features. During the first half of the period, a number of new towns were established and the old strategic centres were renovated to strengthen defence. During the later half of the period, due to fights between the British and the Muslim rulers, many towns decayed and went into oblivion. The general redistribution of garrisons and detachments, throughout the region during the early part of the British period, had induced certain towns like Bhavani, Erode etc. to become more prominent and attain special status from the administrative and strategic viewpoint. After 1858 the development of communication, administration, education, medical facilities, irrigation and power and commerce and trade have all stimulated a number of centrally located villages to grow into urban centres (e.g. Dharapuram, Palladam, Namakal etc.), at the same time provided impetus to the existing centres for further growth.

The concentration of towns in the Nilgiris and north-western hilly tract is mainly due to the plantation and other allied industries. In the south the towns are mostly concentrated in the valleys of the Cumbum, the Vaigai and the Tambraparani. The concentration in a few areas of the Coimbatore Upland is also due to various industries, though unevenly distributed.

As regards the functions, most of the towns (more than 80%) are more or less balanced in commerce and service functions. 10 of the 99 total urban centres in the Region are diversified in character. However, in details, there are about 23 towns specialized in household industries, 20 in manufacturing, 15 in commerce, 12 in transport, while as many as 20 are service towns.

Obviously religion (Palni, Bhavani), defence (Vellore, Hosur), bridge-heads or ferry-points and highways (Pollachi, Salem), water-points such as lake (Ooty) and waterfalls (Courtalam) are some of the important factors responsible for the selection of urban sites in the region. Nodality has played very important role in the growth of urban centres : Mettupalayam on the foot of the Nilgiris, Coimbatore on the main route to Palghat gap, Hosur on the highway leading to Bangalore, Bhavani as connecting link between Coimbatore Upland and northern

upland and Pollachi on the commercial trade route leading to west from Tamilnadu are the cases in point. Some cultural, economic and historical factors have also boosted the prominence of certain towns. For instance, Coimbatore is situated in the vast cotton growing tract of the Tamilnadu, which has helped in the installation of textile mills in and around the city. Pollachi in the midst of groundnut growing area has also strong economic base. Political changes (attaining or losing the administrative functions) are also decisive factors "either to strengthen or weaken the original site and situation of towns": Bhavani gained importance during the early British period when it was made district headquarters, but its prominence weakened when the headquarters was shifted to Coimbatore.

The functional variety and its significance bear a definite relationship with the build of the towns. In general, the main business area, business-cum-residential quarters and congested residential houses with narrow lanes often form the core of the town. The middle zone is characterised by somewhat planned residential houses interspersed with supplementary shopping centres, parks, etc. In the outer zone industrial and residential areas have developed amidst cultivated and vacant lands. In lower order towns only the inner and outer zones become prominent.

Coimbatore (286,305) : The main business area known as *Palaya* (old) market, is centred around the former fort, one of the nuclei of the city. Due to the increase in the volume of traffic, shopping centres have started coming up along the main highways leading to Tiruchchirappalli, Mettupalayam and Avanashi. Some secondary shopping centres have also emerged in the newly established residential and industrial colonies (Fig. 25.8). The administrative units, which were centred around the fort area during the early part of the British rule, have been shifted to the east of the railway line, in the vicinity of the Race Course. Industrial areas have developed along both the sides of the railway which runs through the middle part of the city; large textile, dyeing and oil mills are located along the eastern peripheral tracts of the city. The absence of industries

in the west may be due to the existence of tanks. The low and middle class residential houses are clustered in the fort area (Kottaimedu) and Pettai area. During the British period, the area to the east of the railway line was selected for rather the best residential colony due to its central situation between the trunk roads to Madras and Tiruchchirappalli and in the railway station area. The industrial encroachment in the east and the existence of tanks in the south and west have caused the growth of residential colonies in the north of the city along the main road to Ootacamund.

Salem (249,145) : The business area lies in the

core of the city (Suganeswar temple and the Thirumanimuthar river) and a shopping parade has developed along the Cuddalore-Salem highway (Fig. 25.9). Unlike Coimbatore and Madurai, the administrative area lies in the core of the city rather than on the periphery as during the British period the centre of the city was not so much congested. The growth of industries is a recent phenomenon as is evident from the absence of industries in the heart of the city. The proximity to the railway junction is primarily responsible for industrial concentration (textiles and oil mills) in the western side of the city. Over 40% of the workers are engaged in weaving

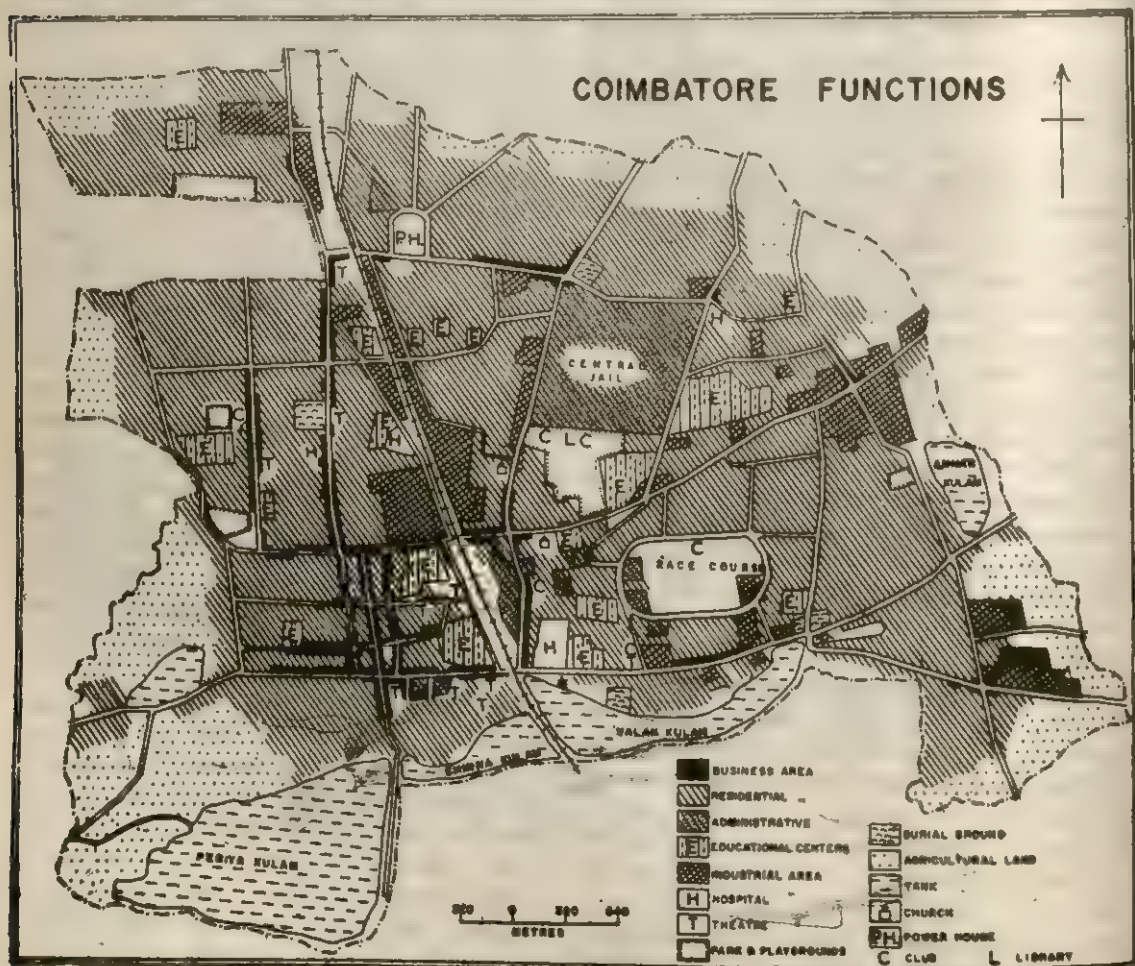


Fig. 25.8

and the houses of the weavers are mostly multi-functional. The central part of the city (Gogai,

colonies have developed at the outskirts of the municipal limit along the main road leading to the railway junction. The social, cultural and educational institutions are found near the administrative area in the heart of the city.

Vellore : The main business activity clings along the N-S running main road through the heart of the city (Fig. 25.10). The recent growth has occurred around the Christian Medical College Hospital, which is one of the most renowned in India. There are number of hotels and lodges in its vicinity serving the patients and their attendants. The administrative area lies in the fort containing most of the Government offices. Highly congested business-cum-residential houses are found in the vicinity of the fort while Govt. residential areas have developed to its south; extensions towards the north and east are not possible due to the river Palar and the hillocks.

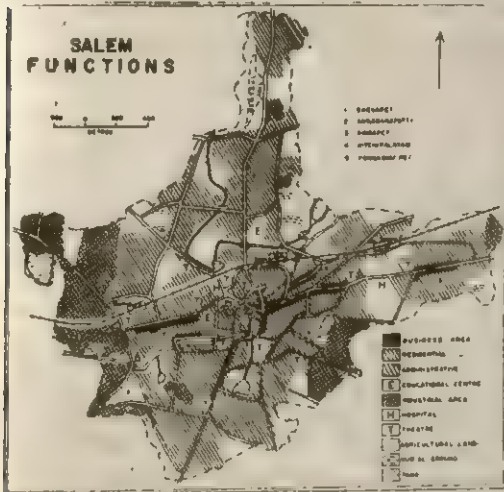


Fig. 25.9

Kitchipalayam, Ponnampet, Shevapet) contains mostly single-storeyed (tiled) residential houses with narrow and winding lanes. Although the city originated with Suganeswar temple as nucleus, the present urban landscape is nothing but a collection of former villages like Anadarapatti, Shevapet, Gogai, Kitchipalayam, Ponnampet, and Ammapet. However, modern residential

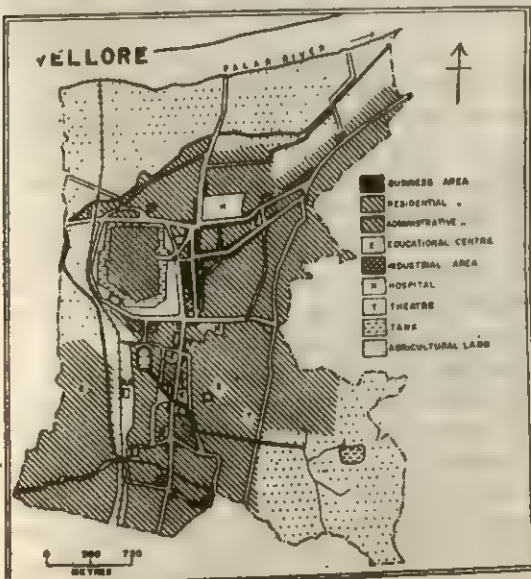


Fig. 25.10

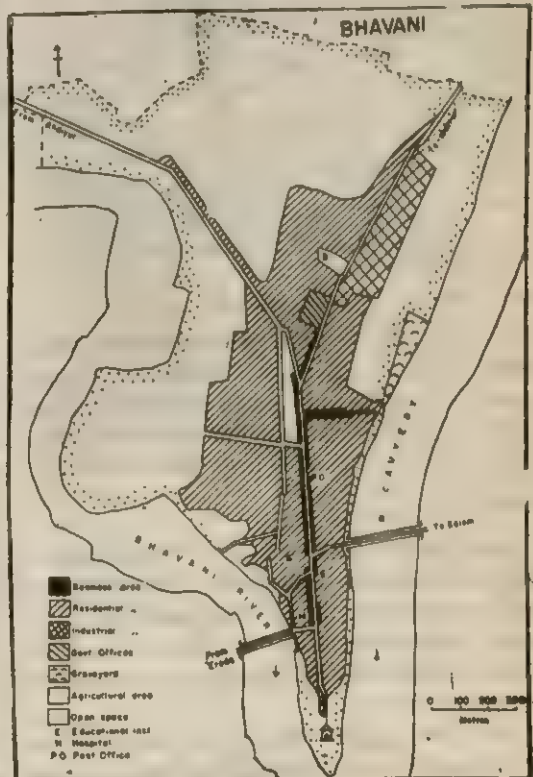


Fig. 25.11

Tirunelveli district. The impact of this cash crop can well be noticed in the growth of textile industries in Srivilliputtur and Ambasamudram.

Millet Region : Salem (53.1%) and Coimbatore (39.1%) are the two important districts where rice is not important due to the inadequacy of rainfall (less than 400 mm) from the retreating monsoon. Among millets, *cholam* is of primary importance. Under irrigation it may be sown any time of the year. The alluvial soils found at the foot of the hills (both in Coimbatore and Salem) are favourable for the more luxuriant growth of this crop. Other crops in order of importance are oilseeds (16.8%) and cotton (13.2%) in Coimbatore and oilseeds (14.5%) and pulses (12.9%) in Salem district. Due to paucity of water in this tract only a small portion of cultivated area can sustain more than one crop a year.

Diversified Region : Even though millet stands first in order of importance (Madurai 34.2%, Thiruchchirappalli 39.0%), paddy, oilseeds, pulses, sugarcane and cotton crops also stand well above the respective regional averages. This can be mainly attributed to the existence of fertile Cauvery, Periyar and Vaigai tracts, apart from good amount of rainfall (900 mm) though less than in the rice tract. Apart from millet and paddy, oilseeds (18.2%) and cotton (7.2%) in Madurai district and oilseeds (17.18%), pulses (4.1%) and sugarcane (1.3%) in Tiruchchirappalli are the dominant crops.

Plantation Crop Region : The Nilgiris and the South Sahyadri are well-marked with plantation crops. Tea, coffee, rubber, pepper, cashewnut, cardamom are some of the important plantation crops grown in this region.

Irrigation plays an important role in the agricultural economy of the region. Surface resources are available in the alluvial basins, while there are also alluvial and Tertiary aquifers which are utilised by wells. The means of irrigation are usually canals, tanks and wells. Canals and tanks are generally linked with the river systems. The following table gives the area irrigated by the various rivers.

TABLE I

Name of the river	Irrigated area in hectares (approx)
Palar	10,430
Ponnaiyar	1,560
Manimuktha river & N. Vellar river	25,058
Cauvery (including Bhavani & Amaravati)	100,214
Vaigai	50,118
Tambaraparani	40,228
Chittar	19,558
Kodayar	32,000
Pazhayar	2,760

(Source : *This is Tamilnadu* and District Census Handbooks).

Apart from these, Periyar Project is a very important irrigation scheme. The catchment area of the headwaters of the Periyar which flows into Periyar lake is 622 km². The Periyar Project is a major engineering feat of the last century in water diversion, because of the tremendous difficulties surmounted, especially the problems of remoteness, intense rainfall, lack of hydrographic data and the rugged terrain. The water is diverted from the South Sahyadri to the Upland Region. The total acreage of land in the Madurai district (Upper Vaigai Valley) benefited by the Periyar-Vaigai Project is 118,330 hectares consisting of 64,712 hectares of dry land converted to wet.⁵¹

The Region has very large area under canal-cum-tank irrigation, particularly in the south east comprising northern part of Thirumangalam and Ambasamudram taluks.

Well irrigation is more important in the entire Tamilnadu Upland region. Coimbatore, Karur, Dindigul and Palni taluks are prominent under well irrigation. The high degree of development of garden cultivation is solely dependent on the wells with troughs and all the important habitations are therefore situated in such areas.

Industry On account of well organised industrial units using modern techniques, the Region is classed among the industrially better developed areas in the country. The remarkable growth of industries is mainly due to the development of

power resources, particularly hydel power. Power generation until about 1908 was confined mainly to a few tiny plants in tea estates run on water power and to the small hydro installation at Kateri in the Nilgiris. The Pykara Hydro-Electric Scheme came into operation in 1932 with the result that the Tamilnadu Upland entered in industrial era. In fact 76.7% of the power generation in the whole Tamilnadu belongs to this region which has helped in the concentration of three-fourths of the major industries of the State. The South Sahyadri, however, is completely devoid of any major industries.

Coimbatore district possesses 31.3% of the factories of the Region, employing 55.1% of the total workers. In terms of number of workers, it is closely followed by Madurai and Tirunelveli.

Large Scale Industries : The main large scale industries are textiles (accounting for 40% of the total factory employment), engineering (15.7), food industries (12.5), chemicals (6.3), and agricultural processing (3.7). Textiles are by far the most important agrobased industry and the State ranks third in the country regarding the number of textile mills. Among the southern States of India, this State employs quite a high percentage of industrial workers (79.9%) in textiles, followed by Mysore State (34.5). 56.4% of the workers of Coimbatore district are employed in textile industries, followed by Madurai (53.7), Tirunelveli (38.2) and Salem (28.2). The rapid growth of towns like Coimbatore, Tiruppur, Madurai and Ambasamudram is partly due to the presence of well-established textile industries. Regarding engineering industry, Coimbatore city stands first in manufacturing units, followed by Dindigul and Salem. 12.0% of the workers of Coimbatore district are employed in engineering works and 7.5% in Madurai.⁸⁵ Madukkarai, which attained urban status in 1961, owes its importance to its cement industry. Similarly, the location of chemical industries along with textile in Mettur with the aid of hydro-electric power system is solely responsible for the rapid growth of that town.

There are plantation industries like coffee, tea, cinchona, cardamom in the districts of Coim-

batore, the Nilgiris, Salem and Madurai. The cement factories are located in Madukkarai, Thulakkapatti and Sankargiri towns. There is an industrial complex developed in Ootacamund and Coonoor taluks (Cordites Factory, Hindustan Photo Films, Needle manufacturing industries etc.). The manufacturing of bricks and tiles are the only important industries in the South Sahyadri Hills of Kerala.

Recently the Government has approved an iron and steel plant at Salem utilising the ores of Kanjamalai. Salem region is expected to grow in the near future as an industrial area.

Small Scale and Cottage Industries : The Government has taken interest in developing a number of industrial estates in places like Mettupalayam, Coimbatore, etc. Among the small scale industries cotton textile employs the largest number of workers (48.2%), followed by food processing (20.1), printing (8.8) and light engineering industries (5.2). Even among the small scale industries non-factory establishments are widely distributed but Coimbatore and Salem districts appear to have the largest concentration. Among the cottage industries, mainly oriented to consumer goods, spinning and weaving, are of primary importance along with mat and basket weaving, carpentry, blacksmithy, fabrication of metal articles and *bidi*-making. Handlooms, which form roughly a fifth of the total in India, are centred in Salem, Coimbatore, North Arcot, Ramanathapuram and Tirunelveli districts. Carpet weaving is the primary base for the economic growth of Bhavani, while tanning and basket making are quite significant around Taramangalam, Ranipet, Polur and Suramangalam towns. Coir and coir-mat making is important in the taluks of Chittoor, Perintalamana, Udumbanchola, Nadumangaru (western South Sahyadri).

Transport and Communication

Relief has played an important part in the alignment of trunk as well as the subsidiary routes in the Region. Owing to the hilly and rugged nature of the land, most parts to the South of Salem district have very few roads. As such all the roads to Bangalore and Mysore from the east and

the south have converged like a funnel at Hosur which is the natural nodal centre. Further, the main road and rail routes from Madras to the West Coast have to run a great distance from north to south in the northern upland region and are then obliged to turn westward, taking advantage of the Palghat gap. It is also interesting to observe that on account of the discontinuous Tamilnadu Hills on the east, the routes from the northern upland region to the eastern sea-board follow either the vleys or gaps between these hill ranges. For instance, the Madras-Bangalore route, both railways and roadways, follow the Palar Valley; similarly the rail and road link between Salem and Cuddalore correspond with Attur gap and the Vellar valley (Fig. 25.13).

Accessibility pattern and surface roads per 100,000 of population per 1,000 km² of area, taken as index show certain interesting features. The index is very high (above 80) in the Nilgiris and the South Sahyadri. Both Rasipuram and Yercaud taluks of Salem and the taluks of Kanyakumari district show an index between 70 to 80. This is mainly due to the rugged terrain. The lowest index (below 20) is recorded in Gopichetti-palayam, Periyakulam, Dindigul, Nammakkal, Kallakurichi and Polur taluks. The rest of the region shows an index ranging between 20 to 70. The low index is mainly due to the low density of population in these taluks. The South Sahyadri Hills are highly inaccessible with over 70% area being more than 16 km away from

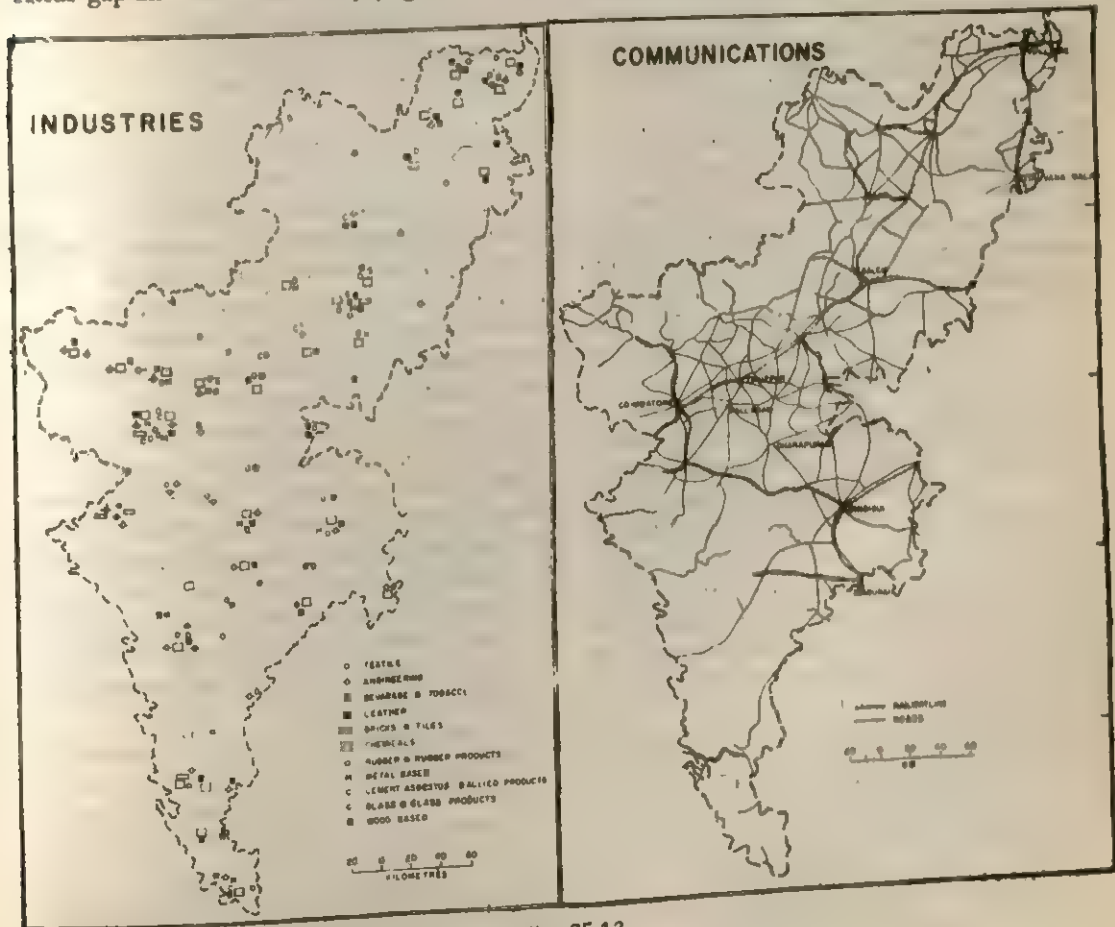


Fig. 25.13

roadways. The southern upland region records least inaccessibility because of the well-spread roadways with only about one-fourth of the area being more than 16 km away from roadways. The taluks like Gopichettipalayam, Chittur, Dharampuram, Bhavani, Hosur, Dharmapuram, Chengam, Nammakkal, Kodaikanal, Melur and Kanyakumari district are devoid of any railway line. The kilometerage per 1000 of population per 100 km² of area is highest (0.11-0.19) in the northern part of the North Arcot, central part of Salem, Erode and Pollachi taluks of Coimbatore, northern part of Madurai and Tirunelveli and Ramanathapuram districts. This index is above the Tamilnadu state average (0.10).

Thus the north-western hilly tract and the South Sahyadri Hills are the prominent inaccessible areas, being 16 km away from railways. However, the Palghat gap in the north and Shencottah gap in the south do provide links towards the West Coast. The Kanyakumari district is also completely devoid of any railway line. One could identify patches of inaccessibility around Tamilnadu Hills and the broken southern hills, within the proximity of Madurai district.

Coimbatore is the only city having air links with Madras, Madurai, Cochin and Tiruchchirappalli.

The Regions

The Tamilnadu Uplands and South Sahyadri Region is divided into three first order regions. The 450 m contour has been taken to distinguish the Coimbatore-Madurai Uplands from the Tamilnadu Ghats in the north and the South Sahyadri in the South and south-west. The striking differences in relief, drainage and cultural features lead to the recognition of eight second order and sixteen third order regions as follows (Fig. 25.5) :

55. South Sahyadri

- (a) Anaimalai-Palni Hills
 - i) Anaimalai
 - ii) Palni Hills
- (b) Elamalai (Cardamom) Hills
 - i) Periyar Region
 - ii) Varushanad Hills

- (c) Agastiyamalai Hills
 - i) Shencottah Tenkasi Region
 - ii) Kumari (Comorin) Hills

56. Tamilnadu Ghats

- (d) Nilgiris
 - i) Nilgiris North or Ootacamund Region
 - ii) Nilgiris South or Palakkadu (Palghat) Hills
- (e) Mettur-Vellore Region
 - i) Mettur Region
 - ii) Vellore Region
- (f) Tamilnadu Hills
 - i) Javadi Hills
 - ii) Shevaroy Hills

57. Coimbatore-Madurai Uplands

- (g) Coimbatore Uplands
 - i) Kongunadu Uplands
 - ii) Cauvery Plain
- (h) Madurai Uplands
 - i) Dindigul Region
 - ii) Upper Vaigai Valley.

The South Sahyadri Region is mostly rugged in nature. The relief varies between 150 m to 1500 m. The highest peak to the south of Himalaya, the Anaimudi (2,695 m) lies in this region. Based on local relief features this region is divided into three second order regions.

The Anaimalai-Palni Hills is the highly rugged region of the south Sahyadri. The Anaimalais project towards north while the Palni Hills trend towards the east. Both the regions are sparsely populated; the Anaimalai has two small pockets of population concentration, mostly non-agricultural and working in tea and other plantations. Kodaikanal (12,860) is located in the Palni Hills and is known for its hill station and the meteorological observatory.

The Elamalais lie to the South of the Anaimalais. The Periyar river cuts through its middle and distinguishes the Northern (Periyar) region from the Southern rugged and highly dissected Varushanad region. The famous wild life sanctuary of Tekkady is in the Periyar region. Though sparsely settled, most of the people are non-agricultural. The head of the Vaigai river lies in this region.

The area is very sparsely populated, and is mostly uninhabited.

The *Agastiyamalai Hills* can be divided into two third order regions as Shencottah-Tenkasi region and Kumari Hills. The famous Shencottah gap separates the Anaimalai from the Agastiyamalai. The famous Cour'alam falls of South India is in the region near Tenkasi. The Tirunelveli-Quilon railway line forms the cultural divide between the Kumari hill region in the south and Shencottah-Tenkasi region in the north. The former is highly dissected and less populated while the latter forming the foot-hill plain zone is very densely populated containing a series of towns. Notable among them, Kadaiyanallur (41,249) and Tenkasi (34,403) are industrial towns while Puliangudi (30,648) and Shencottah (20,528) are agricultural towns. The southern flanks of the Kumari Hills with paddy cultivation are also densely populated.

The *Tamilnadu Ghats* stretch from the Nilgiris in the west to the Tamilnadu Hills in the east. The western portion of this region is more hilly than the eastern. The highest peak in Tamilnadu State, the Doda Betta (2,637 m) lies in the Nilgiris.

The *Nilgiris* form the western section of the Tamilnadu Ghats region being separated from the South Sahyadri by the Palakkadu (Palghat) gap. Its *Northern* portion is more massive and relatively more densely settled than its *Southern* counterpart, the *Palakkadu hills*. It contains the tribal people like the Padugas and Thodas in large numbers. This region contains Ootacamund (50,140), the regional centre and hill station of Tamilnadu State. Other notable towns are Kotagiri (20,737) and Coonoor town-group (52,992) including Wellington which is a military training centre. In the southern region, most of the population is tribal, clinging to the river valleys.

The *Mettur-Vellore region* is divided into two third order regions : The *Mettur region* is limited by the Nilgiris in the west and by Stanley Reservoir (Mettur Dam) in the east. It is sparsely populated mainly due to its rugged topography. The agricultural population is highly scattered clinging to the river valleys. Mettur (27,698)

has developed as a dam site town and contains textile and chemical industries and hydro-electric power generating station. The *Vellore region* has a more subdued relief and is more populated. The settlements are mostly concentrated in the Palar valley. Agriculturally this region is well-developed. A belt of strong concentration of agricultural population is developed between Tiruppattur and Vellore. Vellore (122,761) is the regional centre and has one of the best hospitals of the country. Gudiyattam (50,384), Amlur (39,445), Vaniyambadi town-group (47,918), Tiruppattur (30,799) and Dharmapuri (28,037) are notable urban centres in the valley.

The *Tamilnadu Hills* can be divided into two third order regions : the *Javadis* in the north and the *Shereeroys* in the south, the Ponnaiyar valley serving as almost the dividing line. The Javadi hills are more populated than its southern counterpart. The western portion of the Javadis is more rugged, mostly inhabited by tribal people and is different from eastern and northern flanks as also from the Ponnaiyar valley, which have subdued relief, gradually merging with the Coastal plains. These plains are irrigated and most of the population is concentrated here. The Sathanur Dam 3 km south of Tiruvannamalai provides irrigation facilities. Some of the notable urban centres are Tiruvannamalai (46,461), the largest regional centre in the Ponnaiyar valley, followed by Ranipet town-group (48,003) which is dominant in the Palar valley. Polur (14,764) on the Chaiyar is a small service centre.

The *Shereeroys* are less populated and the population clings to the river valleys. The northern portion is more rugged and here lies Yercaud, a small service centre and taluk headquarters. Coffee plantation is important on the hills. Attur (29,018) is the regional service centre in the Vellar valley.

The *Coimbatore-Madurai Uplands* region is most developed part of the Region forming rather core of the Tamilnadu Uplands. *Coimbatore Upland* and *Madurai Upland* can be recognized as the two second order regions.

The *Coimbatore Upland* region is the most developed, both agriculturally and industrially. Kon-

gunadu upland and *Cauvery Plain* are its sub-regions. The former is a very densely populated region and around Coimbatore town-group a high concentration of industrial population can be noticed. Plantation is important in the southern portion of the region towards the South Sahyadri. Coimbatore (286,305) is the third largest city in the State and is known as the Manchester of South India owing to concentration of Cotton textile mills. Coimbatore-Kuruchchi urban complex (405,685) is developing very fast. Tiruppur (79,773) and Udumalpet (28,345) are industrial centres and Pollachi (54,369) and Palladam (9,806) are service centres.

The *Cauvery Plain* which lies to the N.E. & E. of Kongundu upland is also densely populated. The eastern part of the Cauvery valley is mostly agricultural while the western counterpart has considerable proportion of non-agricultural population. Salem (249,245) is the regional centre in the eastern part and is famous for its handloom products. Some of the other centres in this part are Tiruchchengodu (21,386), Rasipuram (2,3871) and Nammakkal (19,935).

In the western part Erode (73,762) on the Cauvery is the chief centre while Palni-Ayakkudi (56,909) and Dharapuram (26,490) in the south are some other service centres. Gopichettipalayam (27,006) and Bhavani (22,713) are important in the north.

The *Madurai Upland* is divided into two third order regions. North of the Vaigai lies the *Dindigul region*, and southern portion forms the *Upper Vaigai Valley*. Both are agricultural, but the *Upper Vaigai Valley* is more densely populated. The Dindigul region is mostly hilly and the po-

pulation concentration is around Dindigul (92,947) which is the most important regional nodal centre. Industrial population is scattered in pockets in the Upper Vaigai valley; Madurai, located in the coastal plain does influence the region. Bodinayakanur (44,914) is the largest centre in the valley, followed by Periyakulam (36,335) and Kambam (32,517).

Problems and Prospects

The Tamilnadu Uplands and South Sahyadri region presents a dichotomy with the presence of an age-old tribal culture and economy on the one hand and on the other the superimposition of the sophisticated plantation agriculture coupled with modern urban-industrial complex as also adequate decentralization of industrial activity owing to high depression of hydel power. The region suffers, however, from the fluctuation in power-supply as the rivers are mostly rain-fed; the Cauvery, an important source, has its upper catchment in the Karnataka region, and the use of its resources demands an integration of its power development programme between the two regions, and Kerala also is a party to the regional development efforts. The development of thermal and atomic energy, taking place in the Coastal Plains maybe integrated and further strengthened with the general power grid to ensure regular supply. The social structure need be adjusted with the changing times through economic development programmes. The transport net needs improvement in the hitherto undeveloped areas like the South Sahyadri, the Javadi and the Shevaroyis.

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INDIAN COASTS AND ISLANDS

have provided ever since a marine face to India for looking at the overseas realm and it is needless to emphasize that its glory and sphere of influence remain in keeping with the light and strength which the sea board could project.



The Gujarat region (20°1'—24°7' N and 68°4'—74°4' E) covers about 179,320 km² and has a population of over 19.8 million comprising Gujarat State (excepting parts of Banaskantha and Sabarkantha districts included in the Udaipur-Gwalior Region) and the centrally administered territories—Daman, Diu and Dadra and Nagar Haveli (Fig.

26.1). It is mostly a peninsular region thrusting broadly into the Arabian sea in between the Gulfs of Cambay and Kutch; the Peninsular landmass known as Saurashtra since ancient times is rather the core area of the Region, while the Gujarat proper is mostly the alluvial zone on the flanks of the Vindhyan-Aravalli hills. W. Pakistan

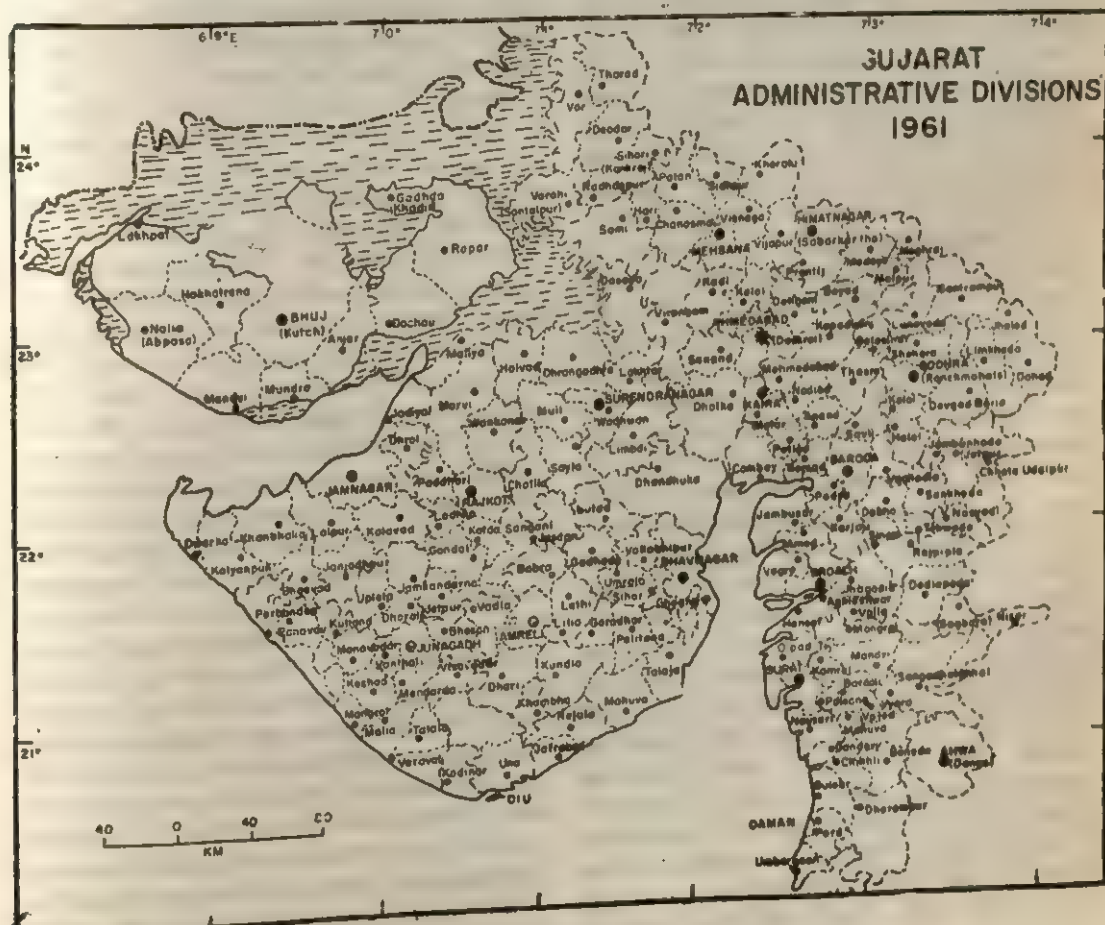


Fig. 26.1

touches the Kutch border, while the Udaipur-Gwalior Region lies on its NE, Malwa Region on the east and Maharashtra Region on the south.

Historical Background

The Gujarat Region is one of the early settled parts of the country and the archaeological and epigraphical evidences denote that before the coming of the Aryans it was a homeland of several Dravidian tribes who lived in villages and towns, and built forts and carried on agriculture and trades. There are evidences now of the extensions in the lower Narmada valley of the Harappa-Mohenjodaro artifacts and cultures. The Aryans who settled early in the Indus valley later colonized the Region. During the Mahabharat period, Dwarka became the citadel of Lord Krishna, and perhaps the region had developed a pastoral culture of its own. The trade contacts of the Region with the Red Sea by way of Africa were established at least as early as 1000 B.C. and with Babylon by way of the Persian Gulf not later than 750 B.C. These routes brought many things in exchange such as the art of sculpture, coining, etc., to the West Coast areas. Broach on the Narmada (Sanskrit Bhrigu-Kachha, Bharu-Kachha of old inscriptions)² was a very developed, rich and busy port and land routes were developed via Ujjaini and Pataliputra to connect it with Tamralipti. Under the Mauryas of Magadh, the region was put under the prince Governor of Ujjain. Missions spread Buddhism among the traders of the coast towns, who had trade relations with foreign nations. After the Mauryas, probably Kathiawar and Sind were under the political control of the Bactrian Greeks, like Menander (c. 150 B.C.). Though political conditinos were unsettled, the foreign and inland trades were at high pitch : trade relations were established with Rome about A.D. 40. and brought great riches to the West Coast. About A.D. 120 Ujjain and Gujarat fell into the hands of a line of foreign Kshatrapas (Scythians) lasting till A.D. 300. Though the Kshatrapas and the Satvahanas of Paithan (on the Godavari) to the south were not always on good terms, the merchants brought enormous wealth to the region and "vied with each, other in

excavating temples and monasteries on all the main roads to the coast."³ With the fall of the Paithan dynasty (A.D. 210) Broach monopolized the European trade, which was very much encouraged by the Kshatrapas, and with the fall of their main line about c. 300, commerce fell into decay. About c. 390 the Guptas of Magadh captured the region and held it till about 460. In Kathiawar, the "Vallabhis (C. 500-700) established themselves on the ruins of the Gupta power."⁴ About c. 600, however, the region was overshadowed by the Gujars of Binmal (near Abu) who subdued the Vallabhis and set up a branch at Broach (585-740). They were quick to assimilate the Indian culture and are regarded as forefathers of some of the most famous Rajput races. Confusion arising after the death of Harsha left the field for Gujars 'whose fortunes henceforward determined the path of Gujarat'. The Muslims invaded the region and destroyed the famous city of Vallabhi (c. 770), but their influence did not last, and the Chavdas, a Rajput tribe, probably of Gujar origin, arose out of confusion to found the first kingdom of Anhilvada (746) with the aid of the Bhinmal Gujars. Literature and Jain religion were very much encouraged by this dynasty. Trade with the Persian Gulf area was also revived, and brought with it the influx of Parsi refugees (c. 775). In the piracy that followed 'the daring sailors of western Kathiawar' took a leading part. In 941 (961 ?) the kingdom of Anhilvada was conquered by Mularaja Solanki, son of a Gujar chief of N. Rajputana; the Solankis reigned until 1143. They had a 'special attachment with the famous Somnath temple, which frequently brought them into collision with the Chudasamas of Girnar (c. 940-1125) who commanded the road to that holy place'.⁵ The latter were subdued, however, by 1113. Mahmud of Ghazni's sudden sack of Somnath also could not threaten the Solankis who continued to remain in balance of power with neighbouring powers and adorn their chief towns with beautiful buildings. The Muslim conquest was averted by the defeat of Muhammad-in-Sam in 1178 which saved Gujarat from serious molestation for more than a century. The Solankis, however, weakened by sub-infeudation,

declined (1143-1242) passing the power to the Baghela chiefs of Dholka, who, never compared with the power of the Solankis; the kingdom shrank to the northern Gujarat and eastern Kathiawar, though commerce continued to remain on high pitch.

The name of Gujarat was applied to this part with the conquest of the area by Alaf Khan under Ala-ud-din Khilji in a single campaign (1298), who fixed his headquarters at Analwara (Anhilvada) in the very heart of the Gujar country (south and west of Abu); as the peninsula of Saurashtra formed a part of the province (under Delhi empire), it was also included under the same general appellation, 'as a political convenience rather than an ethnographical application'. As Hamilton notes the appellation 'Gujarat' was very comprehensively used to incorporate even Malwa and Khandesh (*Gazetteer in force* "Gujarat", 1, 60).⁷ The chieftains of Saurashtra are also notable for colonizing remote areas like Dandakaranya.

The Sultans of Delhi (1298-1392) held only the open country of the region about Patan, Cambay, Baroda and Broach and lower Tapi, while the Kathiawar and Eastern Hills continued to be held by the Hindu Chiefs. The Tonk Rajput converts, as regional governors, became powerful. Ahmad Shah (1411-43) founded Ahmedabad and expanded the kingdom; Gujarat finally fell to Akbar in 1572. The Muslim rule, however, could not erode the Hindu traditions of Gujarat, and brought at its best some 'cultural synthesis, confined strictly to urban areas and manifest in many architectural monuments of the State'.⁸ The decay of the Kingdom of Gujarat enabled the Portuguese to occupy many other areas such as Diu (1535) and Daman (1559), which remained free from the Moghuls or even the British power till they were taken over by Independent India in 1961. The Kolis and Rajputs were always restless; Surat was sacked once by Malik Ambar (1610) and twice by Siva Ji (1664, 1670). Ports of Cambay, Broach and Surat were important for foreign trade. From 1711 the Maratha invasions were more frequent and they established themselves successively at Sungad (1719), Champaner (1723) and Baroda (1734). Ana.chy

was prevalent, and famines more frequent during the 18th century and Gujarat was parcelled out among a number of chiefs; the confusion was aggravated by the dissensions between the Peshwas and Gackwars of Baroda. Out of the chaotic political situation arose the British power and between 1803-1827 the framework of the Bombay Presidency took its form, and administrative set up followed on the lines of Bengal. The present Gujarat comprises four districts of Ahmedabad, Broach and Panchmahals, Kaira and Surat and 59 native states each with an area of over 260 km² (chief being Baroda, Kutch, Nawanagar, Junagadh and Bhavnagar); in addition, there were 259 estates of Western India Agency and 64 estates of the Gujarat Estates Agency, each with an area of less than 250 km.²

After Independence princely states merged with the Indian Union. However, Gujarat comprised three categories of administrative units—the old British Districts alongwith a few States (Baroda etc.) remaining a part of Bombay States, while Saurashtra was made a part 'B' State and Kutch a part 'C' State. In 1956, with the Reorganization of States, Gujarat was reorganized with 16 districts all to form part of the bi-lingual State of Bombay. On 1st May, 1960 Gujarat became a separate State with 17 districts. At present it comprises 19 districts and 85 taluks due to recent changes in administrative units.

The Physical Setting

Structure and Physiography

The Gujarat Region consisting of major and minor peninsulas, gulfs, islands, ranns, creeks, marshes, hills, plateaus and coastal strip is strewn with alluvium and miliolites. With the silting of the Ranns, two tongues of water known as Gulf of Kutch and gulf of Cambay now enter the landmass to define the peninsula of Kathiawar or Saurashtra. The gulfs aid to its commercial activities.

'The ancient Archaean base lies almost covered with later deposits except in the northeastern part of Gujarat where the Aravallis appear as relict feature of the gigantic pre-Cambrian mountain system with pitching anticlines.' No definite

denudation chronology of the past can be outlined. Representatives of the highest Gondwana groups are found in Kutch, resting upon the marine Jurassic rocks and capped by the Lower Cretaceous (Aptian) beds. Lithological marks in the form of plateaus, Umia sandstone and shale (80 km northwest of Bhuj), Wadhwan sandstones (occupying 2400 km²), Narha dark shale and flags overlain by sandstones, Dhrangadhra freestone, Songir sandstone of Baroda, Nimar sandstone, and Ahmednagar sandstone of Idar indicate their Upper Gondwana sequence.

The Deccan Trap lies unconformably over the Umia Series. The Lower stage of Umia Series is marine while its upper stage is equivalent to the Jabalpur beds. These Upper Gondwana Umia beds are largely covered with a thick soil cap. The bore-holes in the north show an alluvial cover. Eocene emissions which might have continued to Miocene explain the varying sheets of lavas. They are frequently traversed by numerous Trap dykes in Kathiawar, but such dykes are absent in the east from where commences the Deccan Lava region. There is little doubt that the lavas buried the former topography leaving a few truncated streams. This intervention set a new lava surface where new drainage system was initiated. These new systems of streams organized themselves either as feeders of the truncated streams or as independent systems. There appears to be simultaneous evidence of elevation and silting by the peninsular rivers in Gujarat. Kathiwar probably was linked with the mainland due to elevation and sedimentation. Relics of former channel-links exist in the form of marshes and lakes as also the Nal depression.

The eastern section of Gujarat may be defined as a projected jet of Sindhu-Ganga alluvial tract in the Peninsular India. This alluvial projection is the outcome of an extensive Pleistocene sedimentation. The Sabarmati, Mahi, Tapi and numerous tiny parallel consequent streams carried in the recent past enough load to advance their alluvial prows in the Gulf of Cambay. This process of deposition is still in progress.

Fronts and rears of mountains lying beyond the precincts of Gujarat appear as hills on its

border. The Arasur mountain stretching for over 160 km terminates in the eastern part of Gujarat. Pavavardh rises to 329 m high. The Rajpipla hills (Satpura hills) are famous for agate quarries. The Parnera mountain in Bulsar district lies in the eastern side whereas the hills of Sahyadri span over 160 km in its southern extremity. The igneous complex of Girnar Hill rises to an elevation of 1,117 m at its Gorakhnath Peak. Various rocks like gabbros, diorites, seyenites etc., probably emanating from the same magmatic reservoir seem to have been ejected through the Deccan Lavas. The Saurashtra peninsular highlands have slender zigzag backbone terminating in two extensive hill masses in its north and south.

To the north of Gujarat the morphology presents a unique terrain of the Rann of Kutch, an extensive country of naked tidal mudflats transected by dead and live creeks. The framework of salt or scum appears as white bonny structure in the dried up creeks. Live creeks form dendritic pattern of drainage and there has been accentuation in this pattern due to earthquakes. A fault-scarp, 3.5-6.3 m high and 8 km long, popularly known as the Allah Bund (God's Dyke) on account of an earthquake in 1819 punctuated the old Indus distributaries into the Rann. The Rann of Kutch and the Little Rann, spanning over an area of 73,600 km², is a micro region in itself. A bird's eye view briefly recapitulates its mud terrains, tiny alluvial basins, dead creeks with whitish vertebrae of salts or scums, numerous marshes of varying dimension and aquatic kingdom dotted with blue dots and defined lakes. Islets and islands project over the bare and broken ribs of the ancient anticline here and there. To its south lies the Kutch. Kutch, formerly an island, is almost surrounded by the Rann except in the southwest. It has a broken backbone of Jurassic-Miocene rocks. The sandstones, capped with basalts, rise to an elevation between 315-385 m. Pachcham island lying further north records maximum elevation of 534 m. On the outskirts of Kutch, alluvial and aeolian deposits occur (Fig 26.2).

Thus, the physiographic divisions may be distinguished as 1. *The Rann* 2. *The Kutch Pen-*

insula 3. *The Peninsular Gujarat* or Saurashtra and 4. *The Gujarat Alluvial Plain*.

Drainage

The present drainage acts like a key to the past and portrays almost connected evolution of the drainage at least in the recent past. The drainage divide is formed by the discontinuous hilly backbone in Kutch. Rising from its southern slope, numerous streams abound from Kori Creek in the west to the eastern terminus of the Gulf of Kutch. They carve out their valleys for a few kilometres before uniting with the Gulf of Kutch. Pachcham island in the north reveals a radial pattern of drainage within its narrow compass from its central summit. In the mud flats of the Rann, live creeks, lakes, marshes and traces of dendritic drainage do not

lack even when they have been modified by recent earthquakes.

The radial drainage pattern of Kathiawar is guided by two hill masses of Rajkot (383 m) and Gir Range (728 m) which are linked by tortuous narrow neck of highland. North-flowing streams unite with Gulf of Kutch and the Little Rann, while south-flowing streams merge in the Arabian Sea. Carving out their valleys in the Sorat sea coast, the Bhadar and Ojat rivers together with other west-flowing streams terminate in the Arabian Sea whereas the eastward drainage lines like the Shatrunji and others discharge their waters in the Gulf of Cambay. A detailed study of the drainage also reveals annular pattern flanking the Girnar Hills. Another drainage source lies on the south-western slope of the Aravallis. The Sabarmati and the Mahi with their feeders form the drainage net.

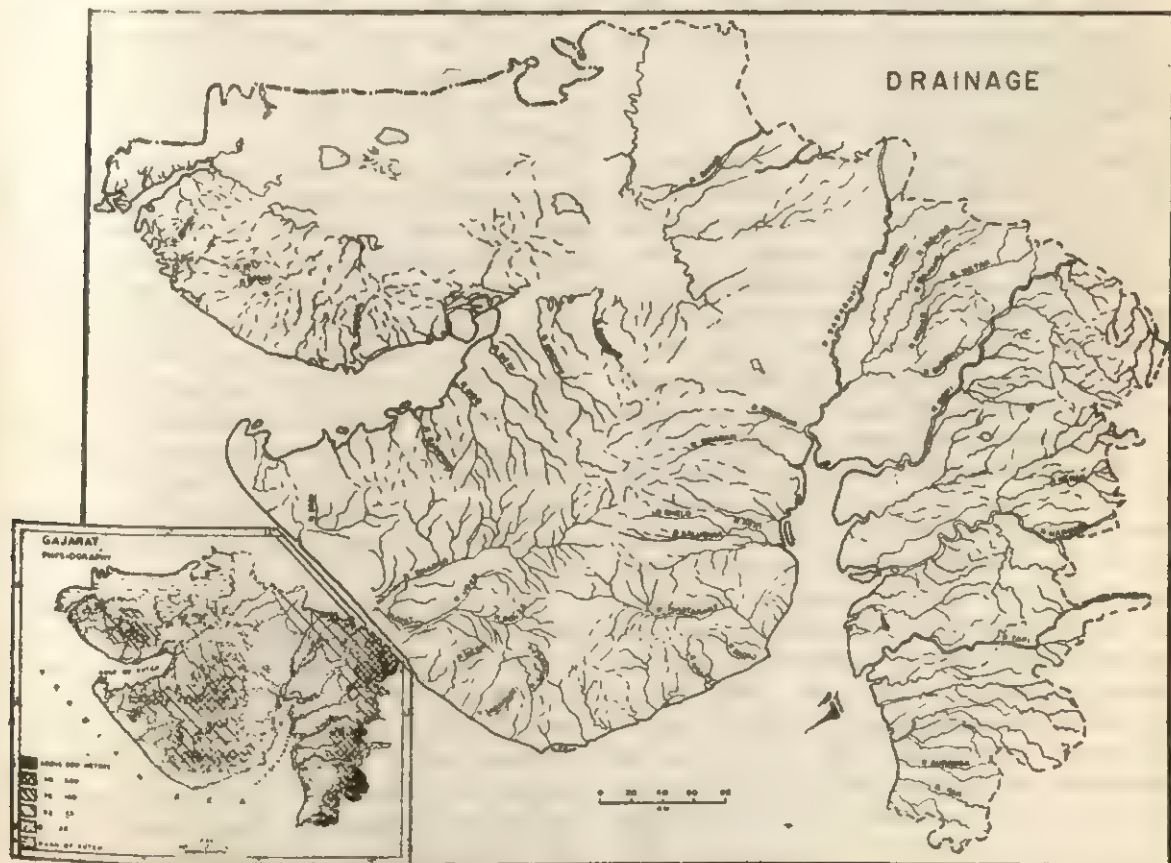


Fig. 26.2

The eastern highland face registers the source of various streams south of the Tapi. The Narmada and the Tapi running from east to west align along the rift valleys. They enter the western coast of Peninsular India to unite with the Gulf of Cambay but the currents generated in the Cambay wash away the silts of the Narmada and Tapi. The free movements of their silt is arrested by the Cambay currents and is further responsible for causing estuary on their respective mouths. The streams south of the Tapi are short, swift and young. They are engaged in notching the scarps of the Western Ghats. The Mahi, the Narmada and the Tapi form the main arteries of the Gujarat Plain whereas the Banas, the Saraswati, the Vishwamitri, the Dhadhar, the Kim, the Purna, the Ambika, the Auranga, the Damanganga, the Shatrunji, the Bhadar, the Aji and a host of other feeders either merge in the Rann of Kutch or fall into Gulf of Cambay and the Arabian sea (Fig. 26.2).

Climate, Vegetation and Soils

The Region bounded by desert fringe in the north and Arabian Sea with major tongues of Kutch and Cambay in the south registers higher temperature in the northern segment and lower in the southern districts. The maximum temperature varies from 36.7°C to 43.3°C during summer, while the minimum, between 2°C and 18.3°C from November to February. In January greater parts of Kutch, Kathiawar and the country south of Cambay record temperatures over 20°C whereas the remaining northeastern parts register between 17.5° and 20°C. In April the isothermal lines of 27.5°C and 30°C trend north to south. The isobars of 1016 and 1017 mb bend northward in Gujarat. The low pressure bars indicate pressure between 1002 to 999 mb in July and the winds are westerly. The northern limit of the summer monsoon is marked by a line running from west to east passing through the tip of Gulf of Cambay. The climate of Gujarat in the south and southwest is mostly moist with an average rainfall of 150 cm, while the northeastern portion is dry verging towards southern Rajasthan with a rainfall of 50 cm. Topography and direction

of winds govern the seasonal distribution of rainfall which is uneven and irregular in several segments of the Region.

The rain is intense in south Gujarat and decreases in the north and west. The isohyet of 40 cm demarcates the Rann whereas that of 80 cm defines the eastern and southern rain belt. The central part, except the hills, receives 40-80 cm rain. The average rainfall varies between 33 to 152 cm. South Gujarat receives rainfall between 76-152 cm except in favourable parts of Dangs where it is as high as 190 cm. Coefficient of variability of annual rain is between 30-35%. North Gujarat records rain between 51 to 102 cm, and the variability ranges between 35 to 50%. The South Central highlands of the Saurashtra peninsula and Cambay Gulf coast region receive over 63 cm rain. Jamnagar and Junagadh coastal lands record less than 63 cm rain with 40-60% variability. The coastal areas near Dwarka, and Kutch are semi-arid recording very low rain and high variability (over 60%).

Vegetation : The natural vegetal cover in the Region is dry thorny forest. Small trees or open scrub characterise the dry segment. The dry scrub terminates into poor grass and bush in the northern coast of Kathiawar and Kutch. Dry deciduous species dot the surfaces of Gir and Girnar hills. Gir protected forest preserves the 'Gir' lion which is extinct in other parts of India. Moist deciduous, thorn and littoral types are also found to some extent. The Dang district leads in forest acreage sharing over 30% of its total area. The reserve forest areas lie in Amreli, Junagadh, Ahmedabad, Mehsana, Surat and other eastern districts.

Soils : The soil map of Gujarat (Fig. 26.3) shows 6 soil-types : Deep Black Soils or Regur, Medium Black, Coastal alluvium, Alluvium-Sandy loam, Sandy Alluvium and Desert (Saline) soil. In addition, red and yellow soils appear on the highland cores of Kutch and northern Kathiawar. Pedological studies show that the basic complex of Gujarat comprises the volcanic rocks except the alluvial plains of the western periphery of Saurashtra peninsula and North Gujarat.

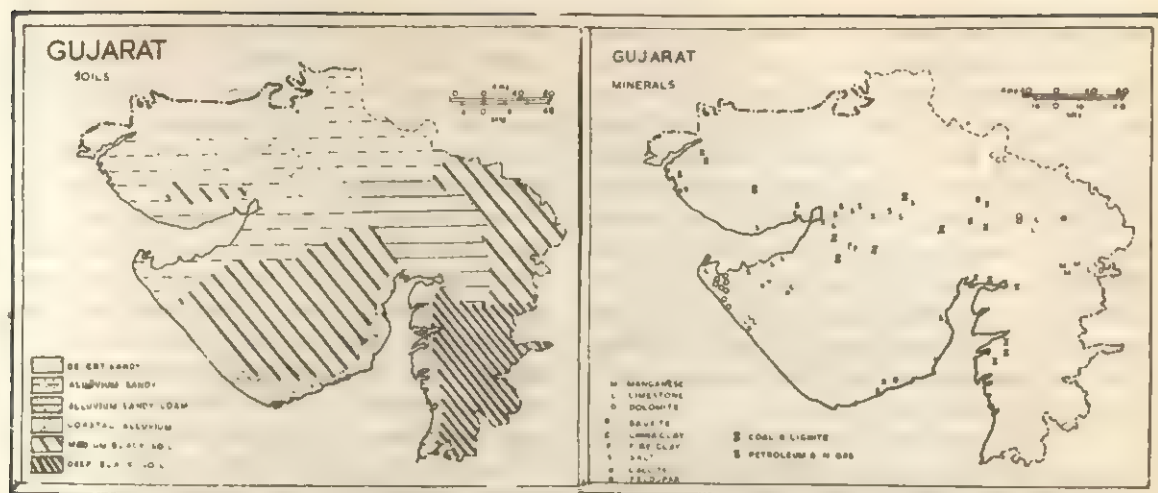


Fig. 26.3

There are two basic soil regions i.e., plains and peninsulas. The Gujarat Plain further exhibits deep black soil in South Gujarat and sandy loam soil having local nomenclature as *Goradu* in central Gujarat. This is an amazingly fertile unit, popularly known as the Garden of Gujarat. The Panchmahals and south-eastern segment of Sabarkantha contain medium black soil. The alluvial sandy soils derived from granites occur in the western part of Mehsana and Banaskantha. The Saurashtra and Kutch Peninsulas, with defined configuration, in general contain soils derived from the Deccan Lava, but each one of them has its special traits. The northern parts of Jamnagar, Rajkot and Surendranagar districts are covered with alluvium sandy soils derived from sandstones, cherts and conglomerates. Black Cotton soil or Regur forms two defined locations. The elongated regur tract running from west to east on the basaltic surface of the broken backbone of Kutch forms the first section while the second segment spans over central Kathiawar with a northeast projection. Medium Black soils occur in central Kathiwar and are basaltic in origin. The Saurashtra coast, north Cambay and western coastal strip of Gujarat are clad with coastal alluvium and miliolites.

Mineral Resources

The chief minerals are limestone, manganese, bauxite, lignite, gypsum, fire clay, fluorspar, do-

lomite, glass sand, etc., (Fig. 26.3). Gujarat leads in production of salt and agate and is second in calcite and third in china clay in the country. Recent achievements in the sphere of oil and gas in commercial quantities and workings of rich deposits of fluorite, lignite and bauxite have elevated its place on the mineral map of India.

Petroleum and Natural gas : The skyline of traditionally textile oriented Gujarat has been punctuated with the discovery and production of oil and natural gas in Cambay basin since 1958. The 3.65 million tonne Gujarat refinery near Baroda (1963) with its giant columns heralded the process of change in the industrial skyline of Gujarat. Succeeding years saw a large size Gujarat State Fertilizer company established in the neighbourhood and wholly sustained on the basic feed-stock supplied by the ONGC's Ankleshwar field.³

The first oil strike was made near village Lunej, about 12 km west of Cambay in September 1958. Cambay field is situated at the head of Gulf of Cambay. In all 62 wells (including 15 at Kathana) had been drilled till the end of 1968-69. Of these 19 are producing gas and three oil. The Cambay field produces about 5 lakh cubic m gas (70% methane) per day though the production fluctuates. Gas is delivered to Dhuvran Power Station. It also produces condensate, a by-product of gas. Kathana oil field now produces 15 tonnes oil per day. The simple asymmetrical

anticline of Ankleshwar is located on the bank of the Narmada, about 85 km south of Baroda. Spanning over 30 km² the oilfields are richest, discovered so far. Out of 200 wells, 170 are oil-producing and 13 are gas producers. The initial production of 100 tonnes per day was gradually stepped up to 8,300 tonnes. It is served by 95 km long trunk pipe line of about 40 cm diameter. Ankleshwar also produces 7.5 lakh cubic m of associated gas per day. They are supplied to Gujarat State Fertilizer Company, Uttran Power House and many private industries at Baroda.

In 1966-67 oil was discovered in scattered structures at Bakrol, Ahmedabad, Mehsana and Kadi (*Ahmedabad Project*). The seismic operations delineated structures at Detroj, Becharaji and Tharad. Mehsana Project was thus initiated out of the Ahmedabad Project. Ahmedabad project has therefore now Kalol, Sanand, Wavel, Bakrol and Ahmedabad oil-bearing structures. Till recent years 171 wells have been drilled, out of which 48 are oil/gas producing and the remaining are dry or under testing. The production rate has gone up from 100 tonnes per day to 1200 tonnes. *Nawagam Project* consists of two fields i.e., Nawagam and Dholka. Till the end of 1969, 72 wells are drilled of which 51 are oil-producing. Koyali refinery receives oil from Nawagam.

Mehsana Project extends from Detroj and Kadi in the south to Tharad in the north. 16 wells have been drilled till recently of which 6 are oil producing. *Aliabet (Off-shore) Project* marks a great stride in oil exploration programme. The base of this project is at Bhavnagar. Off-shore drilling is difficult, hazardous and costly. However, based on Russian designs, Aliabet is heading towards its target and drilling has now been started.

Lignite has been traced recently in the Panandhro and Akrimoti areas of Kutch with a total reserve of 125 million tonnes. Central Fuel Research Institute is engaged in preparing a report for its utilisation. Ambadunagar (Baroda) has one of the richest deposits of *fluorite* in the world with an estimated reserve of 11.6 million tonnes. A beneficiation plant for upgrading the raw fluorspar is under construction with a capacity to pro-

duce 130 tonnes of acid and metallurgical grade fluorspar daily. Its production will relieve the country from foreign dependence. *Bauxite* occurs along the coastal traps of Junagadh, Jamnagar and Kutch. Chief deposits lie at Kalyanpur mahal in Jamnagar district and in Kutch district. Other centres of bauxite are located in Junagadh, Bhavnagar, Kaira, Bulsar and Sabarkantha. *Calcite* deposits occur in Amreli, Bhavnagar, Rajkot, Junagadh and Jamnagar districts. *Limestone* is found in the post-Tertiary and Tertiary rocks in Kutch and Saurashtra in the inter-trappean rock in Kaira district. It is of high grade and there are large reserves. The Region produces about half of *salt* of the country. Besides Dharasana and Magod in South Gujarat, salt is also obtained from subterranean brine in Kharaghoda at Mithapur (Jamnagar). *Manganese* reserve amounts to 28,70,000 tonnes. The largest manganese deposits occur in the Halol taluka, Jambughoda mahal and in Jabugam taluka. The plastic fire clay from deposits in Bhavnagar, Junagadh, Rajkot, Sabarkantha and Surendranagar districts is in appreciable demand. Mehsana and Sabarkantha produce the best China clay in India. The Eklera clay compares very favourably with English China clay. Bentonite deposits occur in Bhavnagar and Kutch districts.

The Third Five Year Plan took a definite step to explore mineral wealth and intensify the mining activities. The Fourth Plan programme will take mining survey work of 15,000 km²; an area of 4,000 km² has already been surveyed. Gujarat will also take steps to exploit other deposits like lead and zinc in Banaskantha, Panchmahals and Sabarkantha districts. Mining of silica, gypsum, etc., has also been taken up to add some substance to its industrial landscape. Silica is confined to Baroda and Panchmahals whereas gypsum reserve in Kutch and Jamnagar districts is of the order of 6.5 million tonnes. Dolomite occurs in Chota Udaipur taluka (Baroda) whereas feldspar is worked in Shehera taluka of the Panchmahals.

Physical Resource Base

The rich agricultural soils, the waterbodies including the coastal areas, the minerals and the

forests constitute the main resource base of the Region though their development and utilisation are only limited at present.

The forest supplies timber, firewood, bamboos, pasture, non-edible oilseeds, *Bidi* leaves, gums and resins. The Gujarat Wild life comprises of several species of wild animals and wild birds. The Gir Forest contains about 177 Asian lions which attract many tourists.

The perennial rivers like the Narmada, the Tapi, the Mahi and the Sabarmati have proved to be great asset for domestic, irrigational and industrial uses. The medium and minor irrigation projects reflect proper multi-purpose use of water. Marine water has promoted fishing and coastal transport. The Region with its long coastline of over 1600 km, broken up by bays, inlets, estuaries, creeks and marshes, provides admirable facilities for fishing. Species like pomfrets, Indian salmon, *bilsa*, jew fishes, prawns, perches, Bombay ducks and tuna are found in large quantities in region's oceanic span of over 120,000 km². In addition, rivers, canals, lakes, tanks, marshes and estuaries form a rich potential source of inland fisheries. The Halar-Okha coast is noted for shell and chank fisheries. Porbandar, Veraval and Bulsar are service stations for fishermen. Development of several ports as fishing harbours is in progress. Refrigeration, marketing, ancillary industries like fish manure, extraction of Shark liver oil, etc., fishery schools and training centres and other measures have promoted this resource development. Though the Gulf of Cambay ports, some of which like Broach controlled the overseas trade during ancient India, have declined due to silting, yet there are some admirable sites for establishing harbours; Kandla creek which has helped in developing the port of Kandla to replace Karachi is a case in point.

The Cultural Setting

Population

Growth Trend : The population during 1901-61 has recorded an increase of about 120%, which has varied from 40.7% in Kutch to over 290% in the Dangs. The Panchmahals has also shown a high growth (219%). All the other districts

excepting Mehsana (95.2) and Kaira (90.6) recorded above 100% growth. Intercensal growth trends have also shown wide regional variation : during 1901-21 the overall growth was about 12%; a significant feature is the positive growth of population in all the districts excepting Kaira (-0.46) and Kutch (-0.7). The high growth in Panchmahals (over 50%) is particularly noteworthy. The region registered an overall growth of about 60% during 1921-51, varying from 17.14% in Kutch to 98% in Ahmedabad. However, 1951-61 has recorded the highest-ever decadal growth of about 27%, varying from 21.3% in Mehsana to 51.4% in Dangs. The areas with low level of urbanisation or those characterised by intensive agriculture with high density of population show below the average growth rate.

The *Distribution of Population* reveals large concentrations in alluvial central plains and southern coastal belts, and becomes sparser both towards the west and east (Fig. 26.4). In fact, the Mainland Gujarat sustains almost double the population of Peninsular lands. A significant secondary concentration occurs on the southern coastal tract of Kathiawar, particularly from around Mongrol to Mahuva as also in small pockets around Rajkot and Jamnagar. Agricultural productivity is the most important factor causing variations in population concentration. The districts of Saurashtra with semi-arid climate and thin medium black soil in the interior and the ill-drained non-arable lands in coastal areas support relatively small population with density below 100 persons per km.² Kutch is an example of very low density (16) with extreme agricultural poverty, arid rocky soils and saline coastal wastes and hardly 14% of its land under cultivation. In contrast, central Gujarat around Ahmedabad (247), Kaira (291) and Baroda (199) forms the most densely populated zone, which is agriculturally very productive and is also highly industrialised. These three districts along with Surat, covering less than 20% of the Region's area have over 40% of its population. Within this zone are included the areas of exceptionally high density (over 400) formed by Central Kaira, part of Baroda and the Surat-Bulsar axis.⁸

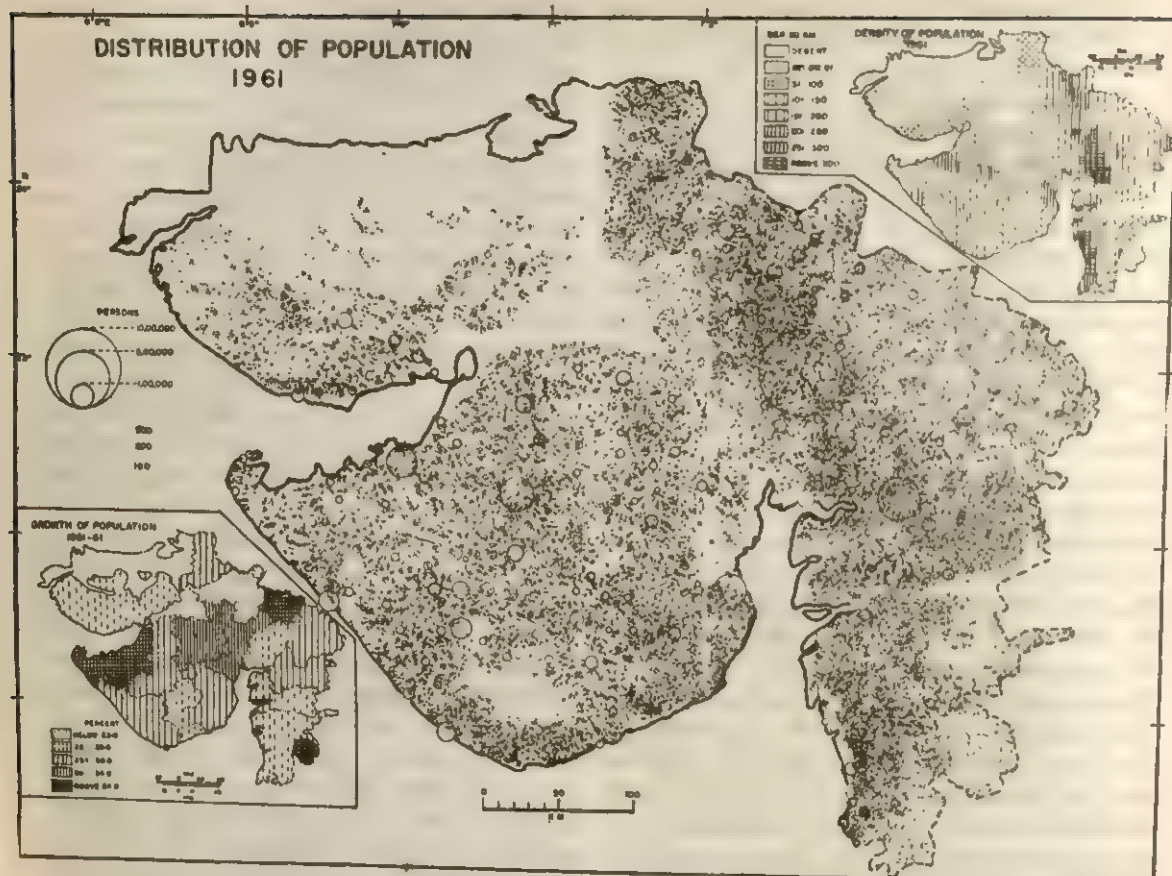


Fig. 26.4

Rural and Urban Population : Nearly 74% of the population is rural. The study of the rural and urban map of 1961 shows the following patterns : (i) The district of Dangs is entirely rural whereas the districts of Sabarkantha (83.3), Banaskantha (92.9), Panchmahals (89.5), Broach (77.85), Mehsana (82.25), Kutch (80.6), Kaira (80.6), Amerli (78.65), and Surat (85.0), have rural population above Region's average (73.97). (ii) Ahmedabad with Ahmedabad City, one of the seven cities of India having over a million population, is the most urbanized district (60.79%). The districts of Rajkot (38.72), Jamnagar (35.45), Bhavnagar (31.48), Junagadh (28.24), Surendranagar (27.99) and Baroda (26.03) have urban population above the regional average. (iii) Fifty eight towns record population above 20,000 whereas remaining

123 towns are smaller. (iv) The towns having population between 50,000-100,000 show a remarkable rise (107%) during 1951-61. The percentage of population living in towns of over 20,000 has gone up within a span of sixty years (1901-1961); there has not only been multiplication of towns in different classes but their number has also increased. The shift from smaller categories to higher ones is significant.

The kernel of urbanism is defined by central Gujarat comprising Ahmedabad, Kaira and Baroda districts. Ahmedabad city exercises its influence on surrounding ten towns. Ahmedabad and Baroda describe an urban axis incorporating within it the towns of Kaira district. Jamnagar city encompasses within its ambit the towns of Bedi and Sikka. Bhavnagar incorporates Sihore

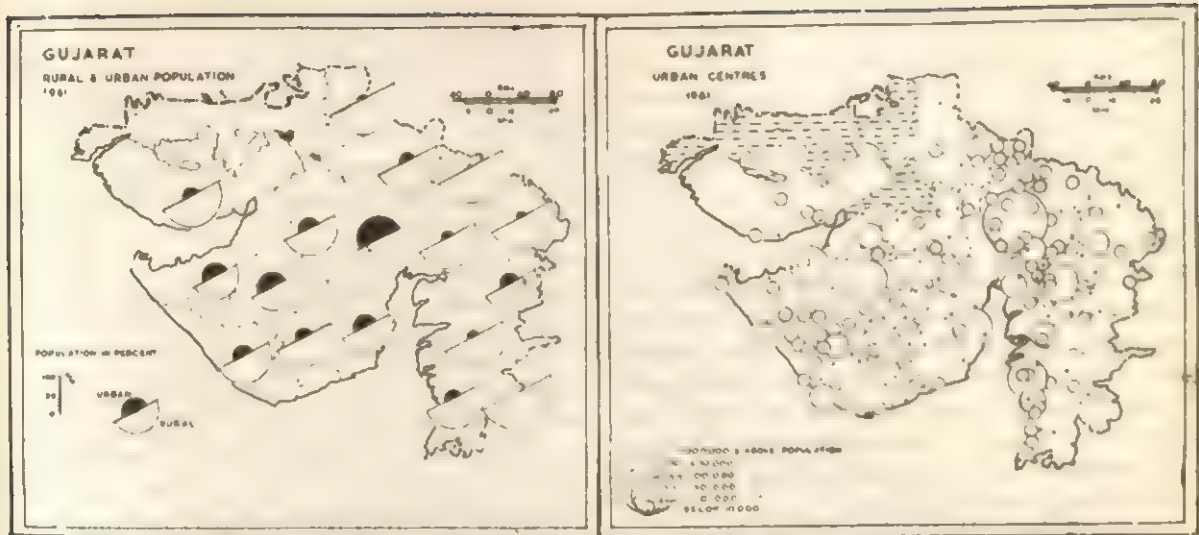


Fig. 26.5

and Ghoghs whereas Baroda's influence is also directed towards Padra, Gorwa and Borsad. Surat spans its jurisdiction over Rander, Katargam, Kathor and Bardoli and further over Navasari and Jalalpur. Ahmedabad, Jamnagar and Rajkot have doubled their population in the last decade whereas Baroda, Surat and Bhavnagar have also registered a remarkable rise of 94, 70 and 71% respectively. Class II towns have also extended their compass of influence (Fig. 26.5)

The Region with its over 5 million urban population shows greater degree of urbanisation (26.03). Gujarat ranks third in urbanisation among the States of India. The change in urban-rural ratio from 1 : 3.9 in 1921 to 1 : 2.8 in 1961 reflects rapid urbanisation. The Princely States of the Region, particularly in Saurashtra, have contributed to its urban make-up as they considered capital towns as an emblem of prestige and developed them with basic urban amenities. There has been substantial migration from rural to urban areas to seek employment in growing industrial segments, which has led to several urban problems.

Studies made by V.A. Janaki reveal functional¹⁰ nature of towns and their population patterns. Manufacturing and trade are immaturely developed while agriculture, the largest single group ex-

cept the luminous group attributed as diversified functions, is still dominant in large number of towns, particularly small ones. Household industry is also dominant in many towns and is much characteristic of smaller ones. Diversified group with no specialised function forms the largest single group. During 1901-61, manufacturing towns indicate the maximum percentage increase (273.83) followed by transport (211.10), construction (125.28) and diversified group (121.45). Trade and commerce (103.66) which are basic functions of towns have not largely contributed to rise of population.

Tribal Population : About one-eighth of the population of the region is composed of tribals, mostly concentrated in its SE part. The highest proportion of the tribals is in Dangs (84.35%) followed by Surat (46.71), Panchmahals (40.16), Broach (37.28) and Baroda (17.48). The infertile hilly areas thus have provided shelter permitting subsistence farming with rice, jowar, Bajra and groundnuts as main crops. The majority of the tribals is composed of *Bhils*; the other notable people are the *Dublas*, the *Narkas-Narkdas*, the *Gamits* and *Dhankas*.

Population Structure : The working population constitutes 40% of the total, and of the total workers 70% are males. Agriculture is by far the most

important source of employment engaging 75.7% of the working force followed by household industry (7.3), manufacturing (7.0) and trade and commerce (5.4). Spatially there is considerable variation in the proportion of workers in different occupational sectors. In the whole of Saurashtra and N. Gujarat more than 60% of the working population is engaged in agriculture while in Ahmedabad it employs less the one-third. South of Ahmedabad, the agricultural tract between the Mahi and the Tapi has more than 70% workers engaged in agriculture. The proportion of women cultivators increases in the south; women exceed men in Surat and are equally important in Broach. In manufacturing Ahmedabad engages over 25% of the workers while Banaskantha has less than 1.

The Region as a whole has an almost balanced sex ratio (939). It varies from 859 (Ahmedabad) to 1041 (Kutch). The sex ratio is high in the least industrialised areas of low density. High sex ratio is also found in the coastal belt of Surat and in isolated pockets in Rajkot, Mehsana, Sabarkantha, etc.

The literacy percentage in the region (36.2) is higher than the national average and has increased rapidly since Independence (23%, 1951). Ahmedabad, has the highest literacy (49.4) followed by Surat (40.6), Mehsana (40.1) and Rajkot (38.1). It is the least in the Dangs (11.5).

Rural Settlements

There are about 19,000 villages of which over 400 are uninhabited (1961). The medium-sized villages (500-2000) comprise over 54% of the total rural population, followed by large-sized villages (2000-4999) with about a quarter. Small-sized villages are of comparatively little significance, comprising as they do only less than 1/7th of the total rural population, while overgrown villages accommodate over 6%. Saurashtra is a region of small villages with larger inter-village distance than the Gujarat proper which is a land of medium to large-size villages. Kaira has the biggest size villages with about 2.5 km inter-village distance, followed by Baroda, Panchmahals and Sabarkantha, all with about 2 km inter-village distance

while the average for Kutch is over 7 km and for Saurashtra about 3-4 km.

Arid fringe and semi-arid lands of Kutch and the Ranns have a few hamlets at long intervals, containing hardly more than a room and a tiny space. Settlements occur on rises, bluffs, piedmont fans and confluence points. Stone-built houses dominate the rural landscape. To the east of coastal and plateau lands of Saurashtra, Gujarat Plain is marked by nucleated villages, whose rims are dotted with huts and hamlets. Settlements appear on sandy rises and along estuaries. The *kaliparaj* (lower strata of people) and *Upaliparaj* (higher strata) constitute rather the two well-defined segments of the settlements. *Upaliparaj* segment is often nucleated whereas *Kaliparaj* section is dispersed around the nucleated segment. The settlements in the eastern hilly areas are dispersed. They contain tribal huts, dispersed or hamleted, covered with grasses, leaves, reeds etc. Mud, stones, burnt-bricks are raw materials for walls. The slope of the thatches is adjusted to the incidence of rainfall. Country or Mangalore tiles dominate every district except parts of Banaskantha, Baroda, Broach and Surat. Houses in the Plain and Saurashtra have courtyards and often contain more than two rooms; elsewhere, one-room and two-room houses predominate the rural areas.

Morphological structure of the village varies widely from region to region. In South Gujarat it forms a cluster of houses without any definite plan though it is often intersected by a main street. It is often divided into blocks named after the inhabiting community or an important ancestor. In Central Gujarat, particularly in more prosperous areas, the village is characterised by rows of habitations belonging to particular community with a central square in miniature called a *chora*. These villages have assumed a rather modern look by electrification and having social institutions like dispensary, school, temple or mosque. In Saurashtra the village is often located on river-side with several wells in the river bed for drinking water. The arrangement of habitations resembles that of Central Gujarat villages though the settlement is often linear in orientation, cling-

ing to the village lane running parallel to the river. The *chora*, however, remains the common fetature in all parts of Saurashtra. The village tank, so typical of South-Central Gujarat, is found only in interior villages of Saurashtra. The Saurashtra village is dominated by the *Kolis*, *Kathis* and *Rabaris*, though not on the same social and economic levels as *Thakardas* and *Patidars* of Central Gujarat. The *Kathis* are landowners and more prosperous, while the *Kolis* are often landless labourers and *Rabaris* are cattle herders, though their nomadic character is disappearing fast. The North Gujarat village is different from the villages of other areas. The semi-arid climate here has necessitated the construction of tanks, often lying on the outskirts. A temple on one side and a deep well inside the tank are the common features. Communal segregation associated with *Patidars*, *Prajapatis* and *Thakardas* is visible. The houses form rows often with common outwalls.

The village in northern Kutch is an aggregate of groups of huts around a tank and separated by clumps of acacia. In taluks like Banni with paucity of agricultural land, each cluster of houses in a village called a *vandh* and an unlined well represents a closely related homogeneous group. The individual house is known as *bhunga* for residential purposes with cattle enclosures called *veddas*.

Sample Villages

Magdalla¹¹ (Chorasi taluka, Surat Distt.), a small but a developed village lies on the south bank of the Tapi 18 km south-west of Surat and about 400 metre away from the Surat-Dumas road (Fig. 26.6). The village (614 acres) lies on a flat plain. It has black soil with some patches of *khar* lands. Owing to the low land, it is in constant danger of being inundated during the monsoons. It is an old village, inhabited by *Habsis* in the 16th century; it is believed that Amir Mustafa and Khudavandkhan came from Yemen to Diu in A. D. 1531 and settled on the bank of the Tapi. The village has 180 houses with 956 persons. It has two clusters, the old and the new. The old site sprang up haphazardly while the new one is built up in straight line along the unmetalled road. The

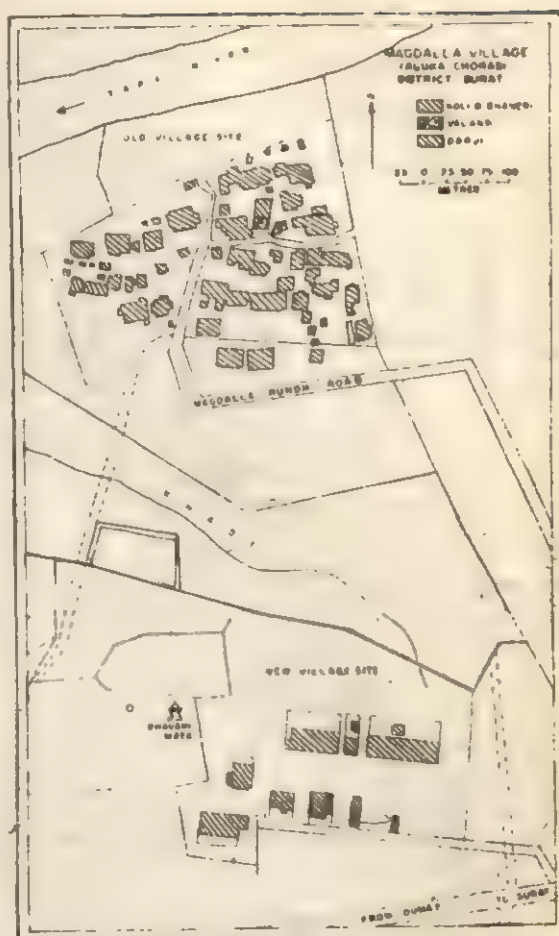


Fig. 26.6

two sites are further divided into six *moballas* or localities. The houses are built in a row with common walls, assuming rectangular shape. In the front there is a verandah and in the rear is a *wada* (backyard). The most common building material is bamboo plastered with mud, while Mangalore tiles are chiefly used to cover the roof. There are also some pucca houses in the village. Of the four communities the *Kolis*, believed to be the oldest inhabitants of Gujarat, predominate the others are *Bbandaris*, *Darjis* and *Valands* (barbers).

Jowar, cotton and paddy are main crops. More than half the area is under food crops. The largest proportion of land (43.33%) is claimed by kharif jowar, cotton and paddy. Lowar is both

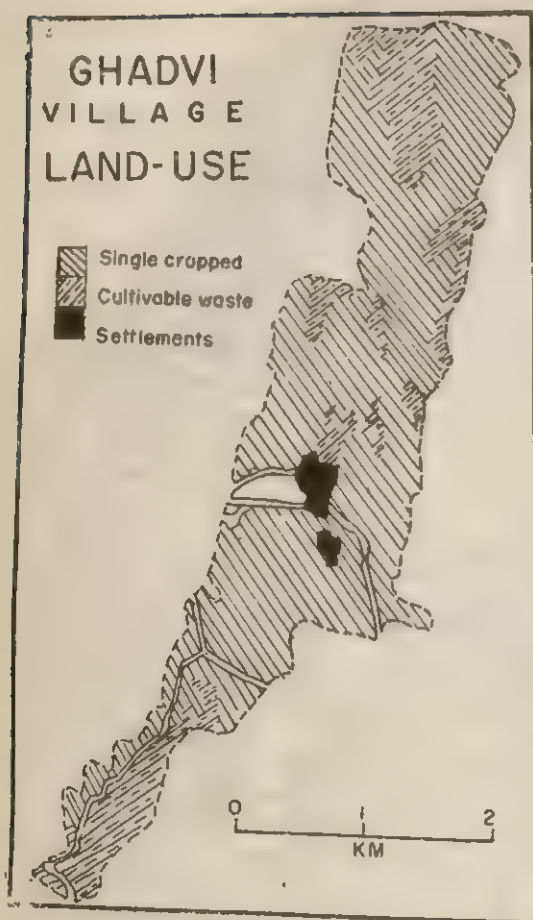


Fig. 26.7

a kharif and rabi crop. Animal husbandry is also important. The village is almost a suburb of Surat and is well-connected (Fig. 26.6).

Ghadvi^{1,2} (Distt. Dangs, Pop. 724, households 143) is situated at a distance of 17 km from Ahwa on the Ahwa-Nawapur metalled road. The village is surrounded by forest area and outcrops of Sahyadri hills. It is settled by the *Bhils*, *Kumbis* and *Varlis* since long. The *Bhil* Raja of Ghadvi is considered as the seniormost in the hierarchy of Rajas and Naiks of Dangs. "The Bhil Rajas who were small chieftains enjoyed secular power over the members of their tribe and over *Varlis* and other economically more advanced tribal peasantry. Basically the Bhils are food gatherers and slash-and-burn cultivators, cultivating small millets called *nagli* on hill slopes with their very

primitive implements like axes and sickles." The houses are built of stones, bamboos and wood with thatched roofs and have in their front small rectangular open courtyard.

Agriculture is the main occupation with forestry as subsidiary occupation; about 17.7% of the village area is under forest while about 77 per cent is arable. Nearly one-third of the holdings are 15 to 25 acres. Principal kharif crops are paddy, *nagli* and *vari*. The village has no irrigation facilities owing to its hilly terrain and seasonal character of streams. There are only two pucca wells. There is also a village school (Fig. 26.7).

Ambav^{1,3} (Thasra taluk, Distt. Kaira, 760 acres, pop. 589) is a railway station on Anand-Godhra railway line. A State highway also runs through the north of the village parallel to the railway. The taluk headquarters is nearly 4 km away. The Mahisagar flows at a distance of 4 km in the south. According to the local legends, the village was established about 300 years ago by the *Patidars* who had migrated from the surrounding areas. The name of the village appears to have been derived from goddess Amba.

Agriculture is the most important single occupation. The *Patidars* (Kumbis) have 70% of the total arable land in the village. Livestock-rearing is subsidiary occupation. Nearly 80% of the total land is under cultivation, the principal crops being cotton, tobacco and paddy, mostly rainfed. Mahi canal now provides some irrigation. The *Bhoi* (water carrier or palanquin bearers), *Valand*, *Bania* (Vaishyas), *Suthars* and *Sindhvas* are other inhabitants.

The houses are in linear clusters (Fig. 26.8). Except a few buildings of *Patidars* which are well built, the rest of the houses are Kachcha. The houses of each caste are clustered in separate localities known as *Vas* or *Fali*. The Harijans and the Christians have their houses at the eastern end of the village. Most of the houses have a verandah in the front and one or two rooms and a courtyard (*Angan*) in the rear.

Urban Settlement

Over 50% of the urban population of Gujarat Region lives in 15 large towns (pop. over 50,000),

though the maximum number of towns are of small size (below 20,000). Almost all the large towns have developed as administrative centres of the former princely States or as industrial centres during British rule : Baroda (298,398), Rajkot (198,145), Jamnagar (148,575) and Bhavnagar (176,473) illustrate the former, while Ahmedabad (1,206,001) and Surat (288,026), the latter.

During ancient times towns like Broach grew as marine gateways to the vast hinterland, and recently developed petroleum resources at Ankleshwar are injecting new vitality. A number of coastal cities in Saurashtra, though small in size, developed as trading out-posts which later also attracted industries : Mithapur with a large chemical plant, Dwarka and Porbandar with cement factories, Bhavnagar and recently developed Kandla port are all notable. Several of the small towns are only district or taluk headquarters. The religious function, above all, has also been responsible for the origin and growth of several small towns in the Region though they are now most stagnant and getting some vitality from occasional fairs; Dwarka, Somnath and Dakor are some of the representatives of such towns.

Most of the cities, particularly in Saurashtra, bear the mark of the past royal associations in the features like a palace, a *sarovar* (big tank), a clock tower, a large gate, particularly in the walled cities, remnants of which can still be seen in Baroda, Ahmedabad, Dabhoi and several other medieval towns. Majority of the medieval towns retain the old core with crowded residential quarters, jam-packed within the walls, presenting to-day a decaying look and the Palace zone is separated from the core by some open space, occupying a large area with the *Rajpath* leading towards the core. As usual, the anglicised appendages like civil lines, cantonments, etc., developed during the British rule and morphological structures associated with modern functions emerged.

Ahmedabad, the biggest city of the Region was founded by Ahmad Shah in 15th century though its fore-runner, the Hindu town of Ashaval existed at the site. It was a walled town with fourteen gates. To-day its two parts are distinct, the old and historic Ahmedabad on the left bank of

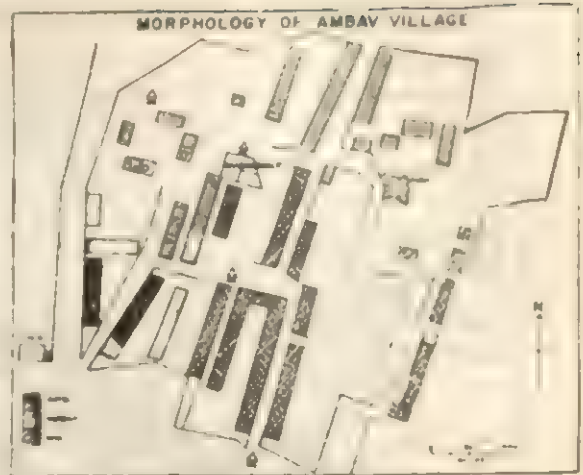


Fig. 26.8

the Sabarmati and the modern and better planned extension on the right bank. The two parts are as much epitomic of their age as of functions and the economic level of the inhabitants. The overcrowded older part is interspersed with historic monuments amidst essentially residential areas with busy shopping parade, while the right bank sprawl is functionally dominated by administration, education and upper class residential colonies. Situated in the heart of cotton-growing area, Ahmedabad has become the chief centre of textiles in India, which have influenced the landscape of the area surrounding the old core, clung mainly along the railroads. A vast area further eastwards is earmarked for further industrial expansion. The University campus holds a site in the central part of the western segment (Fig. 26.9).

Gandhinagar,¹⁴ the newly planned capital city of Gujarat is about 24 km north of Ahmedabad on the right bank of the Sabarmati. The new planned site occupies about 5,500 hectares and is separated from Ahmedabad city by the airport. The NH-8 (Bombay-Delhi National Highway) passes at a distance of about 5 km to its east across the Sabarmati. Work on the new capital project was initiated in July 1964, when the site was declared free from oil.

The architecture of the city will be more functional and in keeping with the Indian traditions than that of Chandigarh. The pattern of main

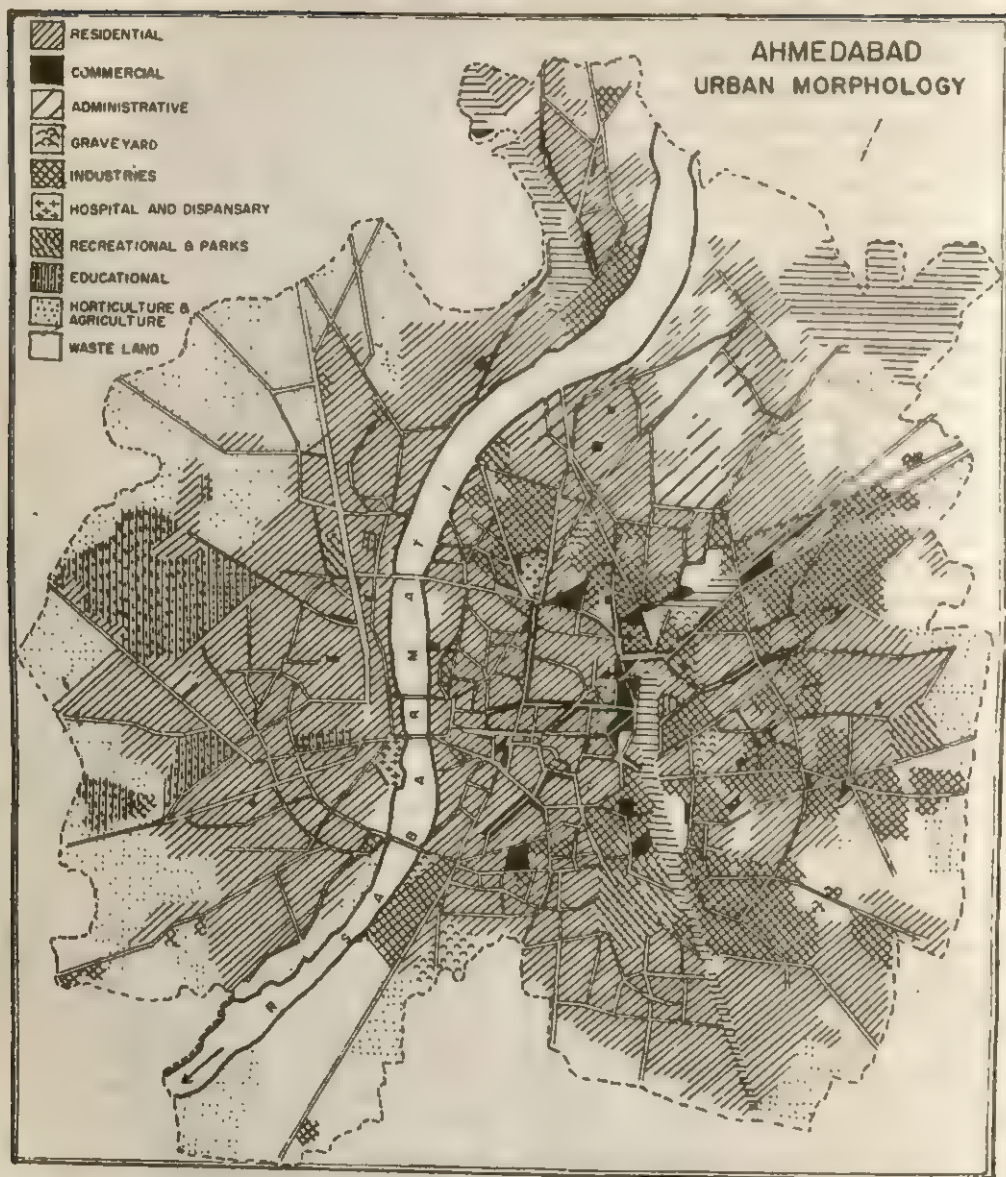


Fig. 26.9

city roads is generally rectangular forming a grid of $1 \text{ km} \times 3/4 \text{ km}$. The riverside road follows the natural features and forms a crescent skirting the proposed recreational area along the river front. The city has been planned around the Government complex with the plan that the lower income residential sectors have been grouped nearer to the central complex and higher income groups further

out so as to neutralize transport costs. It will be a city with a probable population of 1 lakh which will be divided into 30 different sectors, each being $1 \text{ km}/3/4 \text{ km}$, with a population of 8,000. 25 sectors will be residential with necessary services and transport and residential facilities including commercial establishments in the centre (Fig. 26.10).

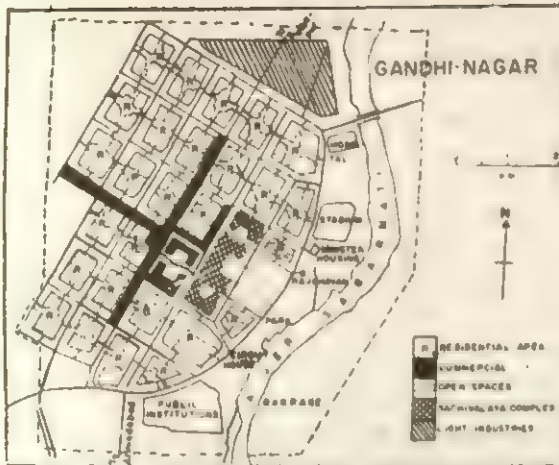


Fig. 26.10

The city comprises four broad category sectors :

(i) Sector 10, comprising the Secretariat, Legislative Assembly, High Court and other offices, located centrally. (ii) The city centre will accommodate the major civic, cultural and business facilities for the city, as well as the main bus terminus. (iii) The public institutions will be located in the city along the crescent road. A large park and recreational area is proposed to be developed along the river front. (iv) Residential buildings of 8 categories have been provided for government employees.

The source of water is the Sabarmati and the power supply to the city is to be provided by the Ahmedabad Electric Company.

Baroda grew as the headquarters of the Gaekwars within the front-wall with four gates. The old part is overcrowded as usual with back-to-back houses, being divided into *pols*. Later expansion assumed a westward creep by accretion around the Sursagar, the city tank showing successive phases of growth. The Sursagar-railway station road divides the city into two parts, the northern being mostly middle class residential area and the southern the official Baroda with a small enclave known as Dandiya Bazar, mainly inhabited by Maharashtrians. Raopure is the shopping area. The University lies between the railway line and the river. A progressive change from the dilapidated structure of Pinjra Pole in the east to the ultra-modern Alkapuri on

the eastern margin is notable. Baroda is partly growing into an industrial centre with textiles, engineering, chemicals and now a petro-chemical complex in the Koyali area (Fig. 26.11).

Rajkot, developed along both the banks of the Aji, is the most centrally located city of Saurashtra. The western part forming the older section is more crowded and dotted with textiles and other industrial units and administrative offices. The eastern section is mainly modern with new developments. Here large sections are car-marked also for residential and industrial developments.



Fig. 26.11

The Economy

Agriculture forms the crucial sector of the regional economy but is hampered by many difficulties and has not yet reached the desired efficiency. Unfavourable climatic conditions in some parts, rocky and hilly terrain with thin or no soils elsewhere, ill-drained coastal areas and the two Ranns are the physical disabilities obstructing agricultural expansion and productivity. Cultural lags in some areas are also responsible for poor yields and except in cotton, the yields in most cases do not even attain the average of

the country. Drought and famine prevail in some parts alternated by floods.

Over 50% of the total area is under cultivation, though the range is very wide, from 15.5% in Kutch to over 77% in Mehsana, and most of the districts range between 60 to 75%. Kutch and Dangs (24.3%) have relatively very low proportions. About 12% of the area is under forests and grazing, about a quarter uncultivable and barren, about 4% each under cultivable waste and, current and other fallows (Fig. 26.12).

Irrigation : The region has very limited irrigation facilities; only less than 10% of the cultivated area is irrigated though the potentials exist for extending the facilities to about 1/3rd of the cultivated acreage. There is wide regional variation in irrigation facilities, being notable in Mehsana (21.8%), Kaira (16.2%), Junagarh (16.6%) and Sabarkantha (13.0%). There are several large and medium and small irrigation projects. Some of the notable ones are the Ukai, Narmada, Kadana (Mahi stage II), Kakrapar (Mahi Stage I), Sabarmati Reservoir (Dharoi), Damanganga, Sipu, Panam, Watrak etc. The Narmada river project, the hope of South Gujarat, has yet to be developed, mainly because of inter-State disputes. The project could irrigate about one million acres

when completed. The four main river systems—the Narmada, the Tapi, the Mahi and the Sabarmati hold out a big promise with over 2/3rds of the Region's irrigation potential. Minor irrigation programme incorporates surface irrigation wells, pumping sets, tanks and *bandharas*. Towards the close of the Third Plan, 952 works were completed, creating an irrigation potential of 351,000 acres.

83 per cent of the net irrigated area is irrigated by wells whereas share of private and government canals is only 14%. During 1968-69, 129,474 pumping sets were installed, which by 1970-71 are expected to increase to 157,964. The number of tube-wells increased from 27 in 1947 to 1,021 at the close of Third Plan. There are now 1,200 tube-wells which irrigate 3 million acres of land in the State. The additional target set for the Fourth Plan is about 300 tube-wells. From tanks and *bandharas* programme, additional potential of 27,800 acres and utilisation of 15,800 acres is proposed to be achieved by 1970-71. From tube-wells additional potential of 7,500 acres and utilisation of 4,200 acres are due to be achieved. The total irrigation potential through minor irrigation works is about 3.7 million acres.

Cropping Pattern: About 60% of the cropped area is devoted to food crops producing about

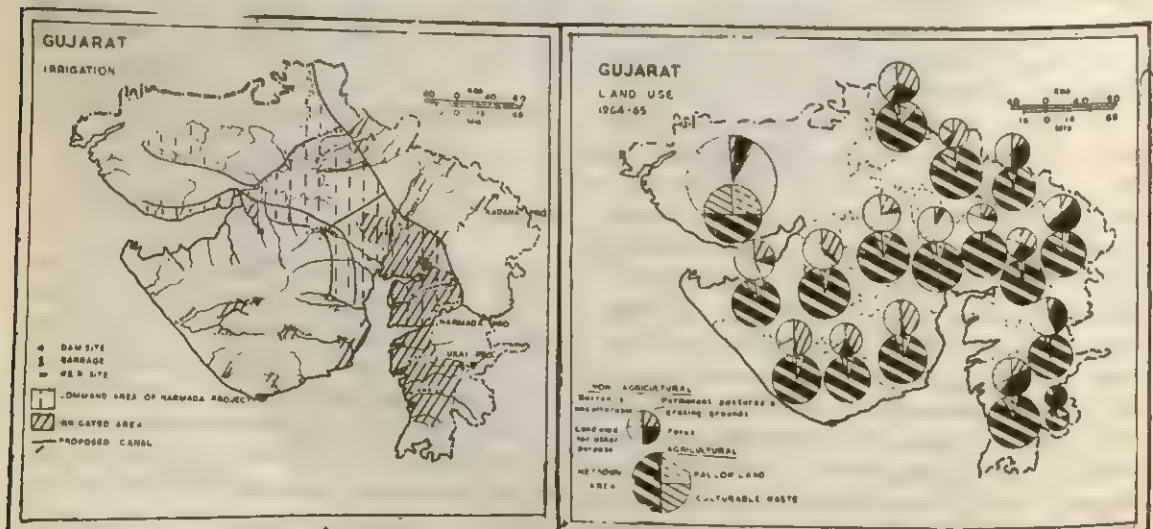


Fig. 26.12

PLATE XVI



An oil drill site in Gujarat



A view of the production installation in Kalal oil-field



The main business thorough-fare of Bombay with Victoria
Terminus Building in the background



The famous Kovalam beach near Trivandrum

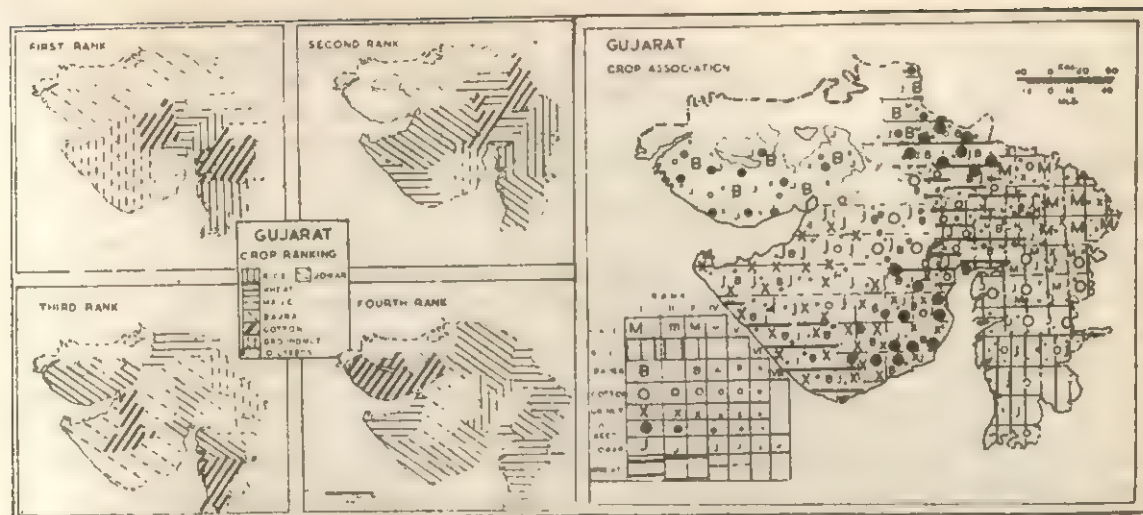


Fig. 26.13

2/3rds of the food requirements of the State (1964-65); jowar, bajra, rice and wheat are the important food crops in order. As compared to most other regions, the cropping pattern here shows a striking dominance of cash crops: the region produces about a quarter of the country's cotton, 1/7th of groundnuts and 1/6th of tobacco. While groundnuts cover the maximum acreage among all crops; cotton stands second and accounts for over 1/3rd of the area under non-food crops. The production of oilseeds has quadrupled and that of cotton has doubled during the last 15 years. While most of the crops are widely diffused, tobacco is concentrated in Kaira (over 2/3rd acreage) and Baroda (about 1/4 of acreage). Over 2/3rds of the cotton acreage is found in the Gujarat Plain, mainly in Surendranagar, Ahmedabad, Baroda and Broach districts, with 60-100 cm rainfall regime; it is mostly a *jirayat* (dry) crop except in parts of Kaira where it is irrigated. The crop is usually rotated often with bajra in light and jowar in heavy soils, and recently high-yielding and staple varieties like *Deviraj*, *Devitji* and Gujarat 67 have replaced the short-staple *deshi* varieties. Groundnut is mostly concentrated in the peninsular Gujarat (78% of the acreage) with light and friable soil; about half the cultivated area in Junagadh and Rajkot districts are under this crop. Though it ranks first in acreage in

the Region, the yields are poor (574 lbs/acre) as against country's yield (665). On the district level, Kaira gives the highest return (863 lbs/acre) while Dangs the lowest (420). The yield has been doubled within 12 years.

Jowar occupies the first place amongst the cereals, followed by bajra, rice and wheat. The crop is widely diffused, with most of the districts devoting over 10% of their cultivated acreages. It is also widely grown as fodder crop. Over 1/4th of the area under food crops is devoted to it with maximum acreage in Mehsana and least in Dangs. Bajra has maximum concentration in arid and semi-arid parts of Sabarkantha, Mehsana, Surendranagar, Bhavnagar and Amreli. Rice and wheat together cover about 1/10 of the cultivated area. Both in acreage and production, rice gets priority over wheat and its maximum concentration is in Surat, Panchmahals and adjoining parts of Kaira and Baroda. About 1/4th of the total area under wheat is concentrated in Ahmedabad and 1/10th in Mehsana. Maize assumes importance in Panchmahals and Sabarkantha.

Crop Association: Considering the crop rankings upto fourth place, seven crop associations emerge: (i) Wheat-cotton-jowar-rice, (ii) Bajra-oilseeds-wheat-jowar/cotton, (iii) Cotton-rice/jowar-maize/jowar/bajra-jowar/wheat/oilseeds, (iv) Rice-wheat/jowar-bajra/cotton-oilseeds/wheat, (v) Oilseeds-

wheat/groundnut-bajra-jowar, (vi) maize-rice/cotton-groundnut-wheat, and (vii) Ground-nut-jowar/ oilseeds/ wheat-bajra/ cotton-wheat/ bajra/jowar (Fig. 26. 13).

Industrial Economy

Gujarat stands prominently on the industrial map of India, being next to W. Bengal and Maharashtra considering the number of registered factories and workers; it comprises over 8% of the industrial units and accounts for about 9% of the industrial employment in the country. It is the largest producer of salt and second largest of textiles among the States and also figures in general and electrical engineering, vegetable oil, heavy chemicals, pharmaceuticals, cement, ceramics, fertilizers and petro-chemicals. It is the only region next to Assam in the development of oil-fields. It is remarkable that Gujarat has a rich tradition for its industrial and commercial enterprise since ancient times. The *Jari* works of Surat and the inlay work of Kutch are widely known. The traditional skill combined with modern technology, particularly since Independence, has provided great stimulus for the remarkable industrial development using, to a large measure, the local materials.

Being away from the coal-belt of India, power development in Gujarat has been limited and till 1950, it was developed mostly under private enterprise with scattered distribution mainly confined to the urban centres. With the formation of the Gujarat Electricity Board (1950), the power production and distribution was organized into regional grid systems. The thermal power is the most important, and among the generating stations Dhuvaran (capacity 254 MW) and Ahmedabad (217.5 MW) in the north, Utran (67.5 MW) in the south and Shahpur (16 MW), Porbandar (15 MW), Sikka (16 MW) and Rajkot in Saurashtra, and some diesel sets in Kutch (16 MW) are the most notable. Dhuvaran power station now uses waste products of the Gujarat refinery. Tarapore Atomic Power station, though located in Maharashtra will provide 190 MW to the region. Among the several hydel schemes, associated with the multi-purpose projects, the Ukai project (300 MW),

will be the largest. Dhuvaran (second stage 280 MW) will also be significant supplier. Gas turbines (54 MW) will also be used for power generation. Thus, the total installed generating capacity in various power houses is 618 MW and almost equal amount is likely to be supplied in near future.

About 20% of the registered factories are large scale units employing over 4/5ths of the industrial manpower. Of these industries, over 25% are located in Ahmedabad, employing more than 50% of the large scale industrial workers of the Region; Surat, with about 1/6th of such units employs only 1/10th of the workers, thus marking a poor second; Kaira and Baroda follow in order. These four industrial nodes together form a narrow belt in the Gujarat plain. A moderate industrial development has also taken place in the four districts of Saurashtra with a semblance of a belt formed by Bhavnagar, Surendranagar, Rajkot and Jamnagar. These industrial belts together employ about 75% of the industrial workers in the State, Ahmedabad alone accounting for about one-half. Surat, a traditional centre of small scale and cottage industries employs about 1/5th of the small scale factory workers of the State. Unlike Ahmedabad and Surat, Baroda presents a balanced picture in industrial employment by having almost equal share in both large and small scale industries, while the Kaira area, like Surat, bears relatively heavily on small scale industrial development.

The industrial structure of the Region is dominated by textiles, using practically all varieties of fibres including synthetics, though cotton is by far the most important. The textile mills account for 22% of the total spindles and 27% of the total looms installed in the country. Their highest concentration is at Ahmedabad with 75% of the installed looms and spindles in the State. In cotton textiles also, Ahmedabad is by far the largest centre, followed by Cambay, Surat and Bhavnagar. Surat, however, is the biggest silk centre including art silk and *Jari* accounting for over 9/10ths of total units, while Jamnagar and Baroda are the most notable woollen centres in the Region (Fig. 26-14).

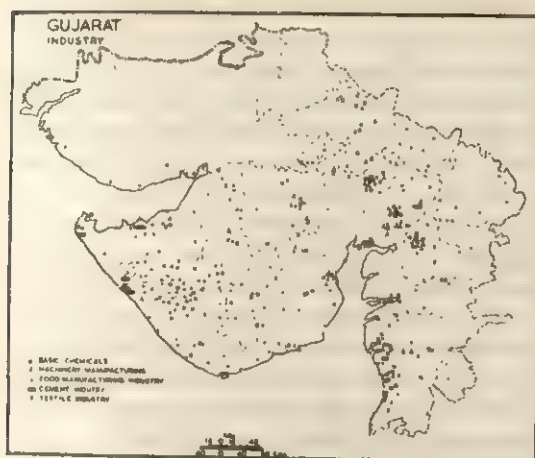


Fig. 26.14

The engineering industry is next to textiles with over 400 factories of various sizes employing about 15,000 workers. In spite of non-availability of iron and steel locally, the industry has gained momentum in several lines such as diesel and oil engines, pumps, spare parts of textile machinery, and several diversified products including electrical equipment. Ahmedabad again is the largest centre with about 2/5ths of the workers and over 50% of the units; it is followed by Baroda, Surat, Rajkot and Bhavnagar. The Region also leads in the production of chemicals and pharmaceuticals in the country, and Saurashtra has the maximum concentration with salt works at Okha including the Tata Chemicals at Mithapur. Heavy Chemicals, particularly caustic soda at Porbandar and Dhrangadhra, fertilizers at Baroda and Bhachau, soda ash (of which 3 out of 4 units in the country are located in Gujarat) etc., are the main lines. Next to Mithapur, Ahmedabad is the biggest centre of the basic chemicals in response to the demand from the textiles and other industries located here. In non-basic chemicals also Baroda, Ahmedabad and Bulsar are notable. Baroda and Partur (Dahisar) are the leading pharmaceutical centres. If basic chemical fertilizers, dye stuffs and pharmaceuticals are taken together, Baroda easily becomes the largest centre of chemical industry in Gujarat with over a dozen industrial units employing about 3,000 workers.

The royal patronage of the Gaekwars has been of definite advantage. For structural clay products, such as bricks, tiles and pipes, Ahmedabad, Surat and Baroda are most important centres employing over 75% of the workers engaged in the industry. The ceramics industry with 10 major units employing about 3,000 workers is concentrated in Jamnagar, Rajkot, Surendranagar and Bhavnagar districts, mainly oriented to raw materials. There are 5 cement factories with an annual capacity of 1.6 million tons; the main centres being Sikka, Porbandar, Sewalia (Kaira) and Devarka. All the raw materials, except coal, are locally available. The cement industry is expected to grow further to produce 2.7 million tons of cement by 1971.

Edible oil, sugar and tobacco are important agro-industries next to textiles. Hydrogenated groundnut oil is manufactured by 7 *Vanaspati* factories with a daily capacity of 165 tons, which are mostly located in Saurashtra. There are 3 sugar factories, the largest being at Kodinar with an annual capacity of 40,000 tons. Tobacco industry, though not well-organized on large scale, is important with 187 units employing about 7,000 workers, Kaira, Baroda and Mehsana being most important centres employing over 70% of the total workers engaged in this industry.

Petroleum refinery and petro-chemicals, particularly developed in Baroda have added to the resources and prestige of the Region. Petroleum deposits of Cambay, Ankleshwar, Padra and Mahavej have an estimated annual production of 4 million tons of crude oil. The petroleum refinery at Koyali, 8 km from Baroda, has been set up with an ultimate capacity of 3 million tons, and first 1 million ton unit was commissioned in October, 1965. Many towns like Rajkot, Bhavnagar, Gandhidham, Mehsana, Godhra and Amreli have drawn an outline of industrial estates whereas Junagadh, Himatnagar, Palanpur, Rajpipla, Khambhalia, Limbdi and Modhapur have acquired land for erecting industrial estates.

A review of the development of industries in Gujarat shows that textile industry was dominating sector of its industrial structure till 1959 but diversification in the industrial structure has been operated and has gained momentum with the

establishment of petro-chemical complexes at Koyali, fertilizer factory at Kandla and part of it near Kalol, Tata Fertilizer Project at Mithapur etc. The 'growth' industries are naturally gaining importance. An industrial survey between 1959 and 1966 shows that there is significant trend of expansion in all the major groups except textiles where declining trend is obvious because of several odds including the use of worn-out and obsolete machinery.

Transport and Communications

The Region comprises over 5,000 km of railways and 24,000 km of roads. On the whole, it presents a better picture; its development is not commensurate with the industrial growth, particularly

in roads. Rail and road kilometerage works out to respectively 3 and 14 km per 100 km².

Railways : Transport map (Fig. 26.15) portrays the rail-nets on either side of the Bombay-Baroda Line and Ahmedabad-Viramgam-Little Rann Line. The Bombay-Baroda broad-gauge line via Godhra goes to Delhi. The branch lines radiate from this main stem to the piedmont section of the eastern highland tract. The only rail line that crosses the State's border in the east branches off from Surat to unite with Bombay-Nagpur line at Jalgaon. Another closed rail-net of metre gauge is around Mehsana from where five rail lines radiate.

The Saurashtra Peninsula is traversed by railways engulfing wide spaces as the configuration is not favourable. No railways follow the coast

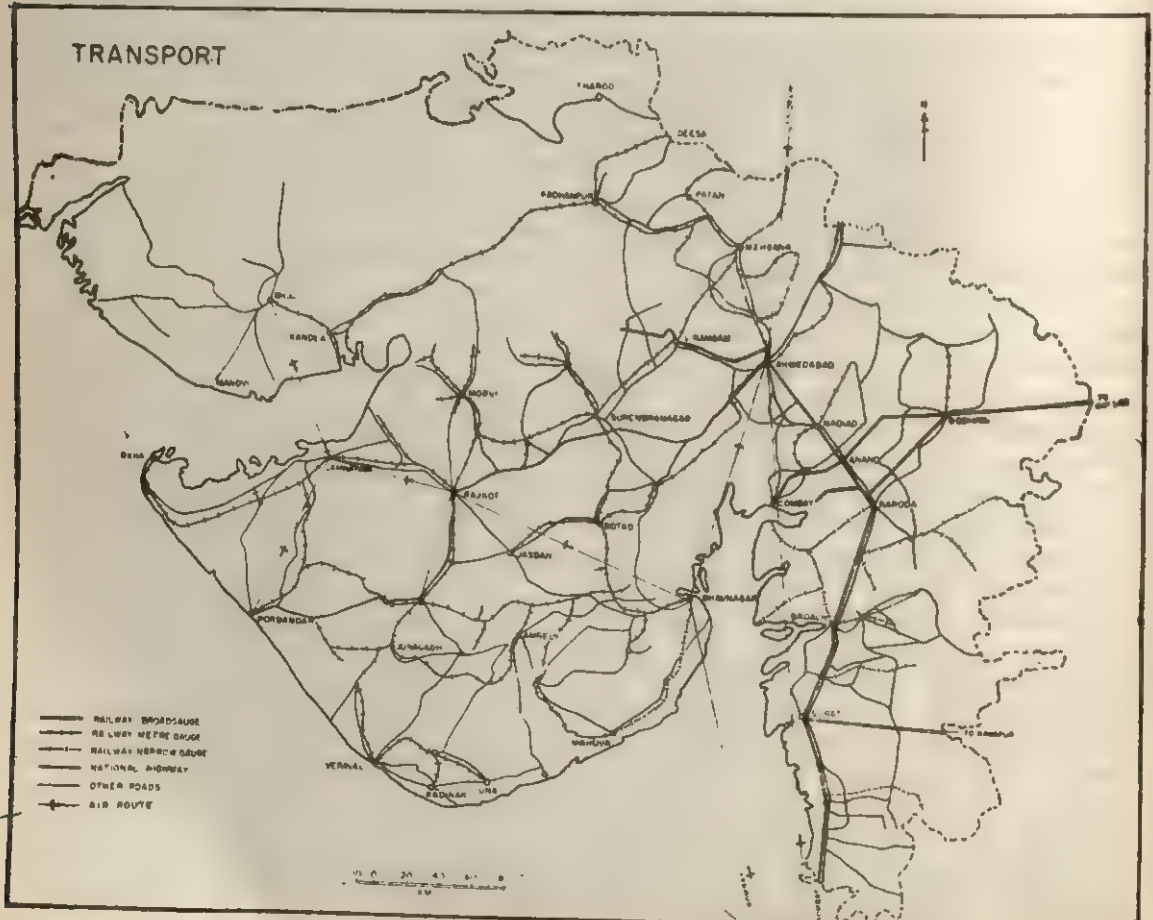


Fig. 26.15

but a few of them terminate at sea ports like Diu, Veraval, Porbandar and Okha. Morvi junction has a few branch lines. Kandla port has been linked by road. The rail development in Kutch is limited to the Palanpur—Bhuj line. Rail lines from Palanpur and Deesa cross the State boundary to Rajasthan. The railways have not yet been extended to the Eastern Highlands, Aravallis, Deserts and Ranns.

Road Transport : The State road transport operates the nationalised services. There has been great progress since the formation of the State. Luxury bus services join Ahmedabad with Baroda, Rajkot, Bhavnagar, Jamnagar, Bhuj, Cambay and Ambaji. The State as a whole has achieved more than the Third Plan target of 24,285 km. Fourth Plan target is to construct 3,020 km of roads under different heads. The National Highways passing through the Region are Delhi-Ahmedabad Road, NH 8 (512 km in Gujarat), Ahmedabad-Kandla Road, NH 8A (366 km) and Bamanbore-Rajkot-Porbandar, NH 8B (218 km). There are bottlenecks like the narrow bridge across the Narmada near Broach, single line carriageways etc. which require immediate tackling.

The long coastal strip is poor in road net as also in railways, and naturally the only convenient means of transport for through traffic from port to port can be a continuous road. Coastal Highway from Lakhpat to Sanjan (1,751 km) has been included in the Fourth Plan. It will enable the utilisation of the coastal mineral resources and industrial potential between Baroda and Okha. The Coastal Highway will further serve the needs of the speedy transportation of industrial goods from the industrial centres-Baroda, Ahmedabad, Dwarka, Porbandar, Veraval etc. It will also provide direct communication from Dhuvaran Thermal Power Project to Bombay and Kandla. Salt works at Port Bedi, Bherai and Victor together with sugar factory at Kodinar will also be benefited. Besides linking religious centres like Dwarka, Prabhas Patan (Veraval), the coastal Highway will help keep an eye upon the coastal smugglers.

Ports and Harbours : Gujarat is a maritime state

of great significance. Apart from the major free port of Kandla, it contains 46 ports well distributed along its coastal stretch of 1,650 km. There are 10 intermediate ports and 36 minor ports which together handle 40% of the country's traffic handled by such ports. Kandla, even with the creation of a free-trade zone, has not triggered the regional development as desired; it handles over 2 million tons, mostly consisting of imports. The other ports handle about 3.5 million tons. Five Year Plans have taken definite steps in improving engineering and port handling facilities. During Fourth Five Year Plan Porbandar Port will be developed as an all-weather port and Okha will have dry cargo berth. Kandla has placed Gujarat on the world's ocean routes. The coastal sea routes will act as feeders.

Air Transport : Recently air transport has made headway, and internal air net is formed by linking Ahmedabad, Rajkot, Jamnagar, Bhuj, etc., as also with Bombay, Delhi, etc.,

The Regions

The Gujarat region is an area in which accordant areal relations bring about cohesion of a certain order. The maritime make-up of Gujarat endows it with a geographical personality of distinct character. Its morphology, drainage, climate, natural vegetation, deserts and Ranns, in harmony with human activities, lead to design regions of various orders. This order, not unlike in other regions, is a compromise between homogeneity of natural and cultural landscapes and the functional integration of the two. The Region is divided into two first order, five second order and 12 third order regions as per following scheme (Fig. 26.16) :

58. Gujarat Region West

(a) Bhuj Region

(i) Rann Region

(ii) Kutch Peninsula

(b) Kathiawar Region

(i) Kathiawar North

(ii) Kathiawar Core Region

(iii) Kathiawar Southern Coastal Region

59. Gujarat Region East

(c) Ahmedabad Region

(i) Ahmedabad Region East

- (ii) Ahmedabad Region West
- (d) Khambhat (Cambay) Region or Baroda-Surat Region
 - (i) Khambhat Region North (Baroda Region)
 - (ii) Khambhat Region South (Surat Region)
- (e) Eastern Hilly Region
 - (i) The Panchmahals
 - (ii) The Narmada-Tapi Tract
 - (iii) The Dangs Region.

Gujarat Region West

Gujarat Region West consists of Kutch and Kathiawar peninsulas. Both of them stand apart with their contrasting environs and emerge as two second order regions—*Bhuj Region* and *Kathiawar Region* respectively. The emergence of land with the retreat of sea has resulted into Rann, a huge

stretch of naked tidal mudflats, isolated saline flecks and dead creeks bounded by salt. The Kutch has extended its northern bounds by engulfing the Ranns. The gulf of Kutch separates the two peninsulas from it. The highland core is encircled with coastal alluvium and milliolites.

The *Bhuj Region* is composed of disintegrated sandstones with intrusive and interbedded basalts, skirted with fluvial and aeolian deposits. The relief attains greatest elevation in the northern part of the Panchmahal island. The hill patches appear in the Rann indicating dissection of the discontinuous anticline. The Rann forms a gigantic terrain composed of muds forming monotonous flats broken by dead creeks. Irregular salt skeletons stud the mud-flats. Dendritic rills although modified by earthquakes run as patchy veins of the Ranns. The Little Rann is

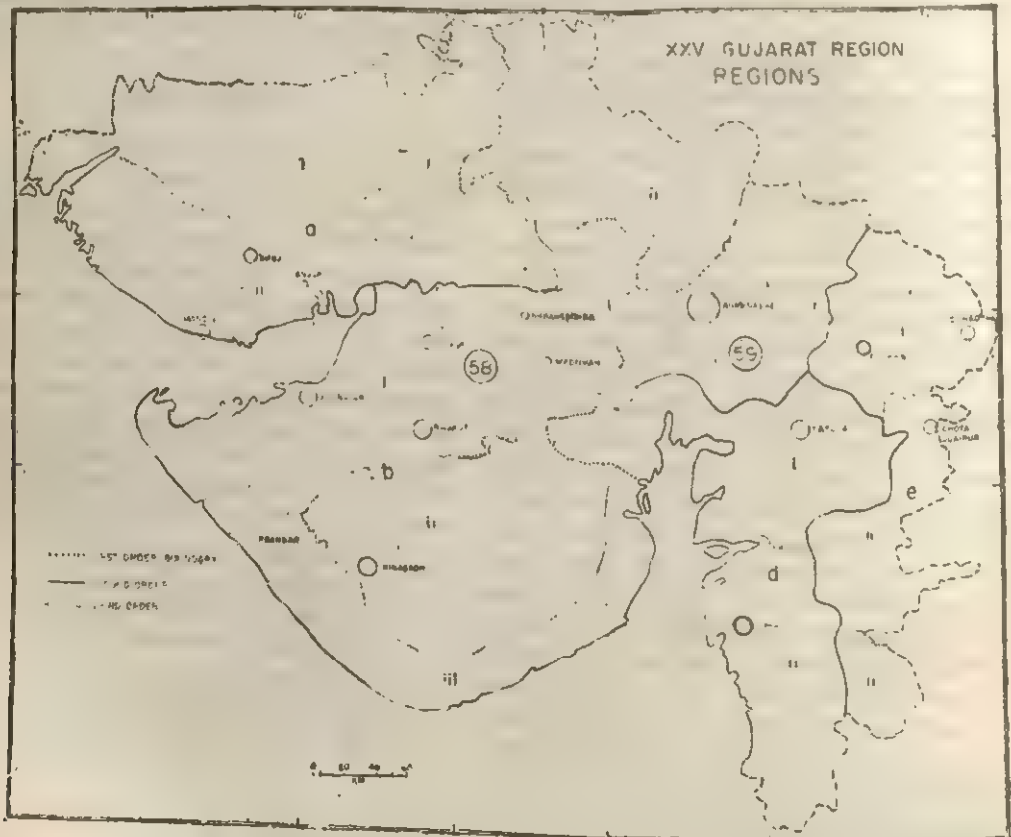


Fig. 26.16

united with rivers draining the north-eastern part of the State and northern part of Kathiawar.

The region is hot and dry with very high temperatures in its desert fringe in the north. Except the southeastern part (40-60 cm) the region receives less than 40 cm rainfall and the variability is over 60%. The Rann and the Little Rann contain desert sandy soil, mostly saline. The Kutch proper has medium black soil in its central part. The alluvial sandy soils stretch on flanks reaching the Rann and the Gulf of Kutch. The Rann is barren country but Kutch contains thorny scrub. Only 2.09% area is under forest. More than 76.81% is barren and uncultivable in Kutch. Taking a very redeeming view, it can be stated that only 20% of its land can be utilized for agriculture after combating variability of rain, drought and rough terrain and inaccessibility. Pasture land is less than 2%.

Bajra takes the prime place among the agricultural crops, other important crops being oilseeds, jowar, cotton, groundnuts and wheat. All these crops grow in the southern and western segments of the region.

The Bhuj region is most scantily populated and exhibits three distinct units : practically unpopulated Rann, the central rocky core having a density of less than 50 persons per km² and the southern coastal segment with density ranging between 50-100. Over 80% of its inhabitants are rural.

Kutch has reserves of 172.88 million tonnes of lignite, mostly in western part (Lakhpat and Mandvi taluks). Limestone (res. 7,765 million tonnes) occurs at Abdasa (Lakhpat taluk). Bauxite is found in Mandvi, Abdasa, Nakhtrana, Lakhpat, Bhuj, Anjar and Nagrecha. Its total estimated reserve is 5.85 million tonnes. Salt occurs at Padana, Kandla, Mundra and Jokhan. Anjar has a textile factory. Bricks and tiles and other structural product industries are located at Adipur and New Kandla. Assembling of motor vehicles is centred at Bhuj. Gandhidham has petro-chemical industries. The important ports for fishing industry are Lakhpat, Mandvi and Kandla. The only metre gauge railway, traversing its east central part, terminates at Bhuj. Tiny port of Tuna and Kandla are linked by rail.

Bhuj (40,180), the regional service centre and the headquarters of the district of Kutch, has two settlement segments: (i) Bhuj Municipal area (38,953) and (ii) Military area (1,227). Being a route centre, it has emerged as an important collecting and distributing centre of the region. Mandvi (26,609) is a small industrial and service centre. Anjar (23,301) is also a small town and functions as industrial, service and commercial centre. Gandhidham (26,514) has two segments, municipal area having most of the population and the military area. Kandla (9,617) is a new but important port and has attained greater significance since Independence. Its development was taken up by the Government of India in 1949. It is situated on the Gulf of Kutch where the minimum water depth is 9 m and hence big ships can safely be berthed here. It possesses a jetty having a length of 820 m. The port is now equipped with cranes, godowns, floating docks etc. Kandla serves a large hinterland (1,012,000 km²). A railway line of 275 km has been constructed to link it with Deesa through which Delhi-Ahmedabad line runs. Another railway line traversing over a distance of 210 km has been constructed to link Kandla with Ahmedabad. Local diversities thus help in defining two third order regions : (i) *the Rann* and (ii) *the Kutch Peninsula*.

Kathiawar region includes the districts of Jamnagar, Junagadh, Amreli, Bhavnagar, Rajkot, Surendranagar and Diu. The region has an irregular highland core. The hill masses covered with Deccan Lavas are surrounded by the Oligocene and Pleistocene deposits. The Dhrangadhra-Wadhwan sandstone plateau distinguishes its physical personality. Girnar Hills conspicuously mark the relief where the streams exhibit an annular pattern of drainage. The sea and the low coasts, covered with sands and alluvium, seem to unite with highland fringe outlined by 75 m contour. The altitude gradually rises to 300 m and over to depict different grades of surfaces. The peninsular configuration modifies the climate, especially along the coast. The annual rain in the region, except the central part, is between 40-60 cm. Girnar records rain

over 80 cm whereas the central part receives 60-80 cm. The variability of rain increases from east (35%) to west (60%).

Dry deciduous vegetation is found in Amreli, Junagadh and Bhavnagar but thorny scrub appears in patches in drier parts of Kathiawar. Littoral vegetation, though discontinuous, forms a significant segment in Junagadh. The dry deciduous forests preserve the animal kingdom, particularly the Gir Lions. The region is primarily agricultural (net sown area 62.7%). Piedmont fans and broad interfluvies constitute favourable agricultural tracts. Old systems of irrigation such as tanks, valley bunds and wells still safeguard the agriculture. Dykes as the base of aquifers keep the water-table high. Groundnut takes first place in Jamnagar, Rajkot, Amreli and Junagadh whereas cotton in Surendranagar. Rice, occupying seventh place, is grown only in Amreli and Junagadh. Dwarka has marginal agriculture.

Mineral resources are considerable. Limestone quarries are located at Jamnagar and Junagadh. Salt pans are found along the southern margin of the Little Rann and the southern coast of the Peninsula in Junagadh, Amreli and Bhavnagar districts. The western part of Jamnagar has most of the bauxite workings of Kathiawar. The bauxite mines are at Virpur, Rann, Mahadevia, Nandana, Bhatia, Lol, Kenedi, Bankodi, Lamba and Gandvi. Fire clay occurs at Hasanpur and Roti-Davli (Rajkot) while calcite is found at Govana, Lakhasar and Normana (Jamnagar).

Textiles constitute the main industries of the region. Cotton textile units are located at Bhavnagar (20), Jetpur (11) and Rajkot (8). Limbdi, Surendranagar, Morvi, Wankaner, Gondel, Porbandar, Junagadh, Amreli, Sabarkundla and Mahuva are other centres. Woollen textile centre is at Jamnagar whereas silk textiles have developed at Jamnagar, Amreli and Bhavnagar. Bhavnagar has also 3 units of other textile works. Bhavnagar has two paper and pulp units. Ferro-metallurgical industries are located at Bhavnagar, Jamnagar and Vartez. Rajkot, Jamnagar, Okha, Porbandar, Junagadh, Veraval and Bhavnagar manufacture iron and steel furniture. Structural steel products are manufactured at Rajkot, Bhav-

nagar, Sihor and Palitana. Cement works have developed at Dwarka, Sikka and Porbandar. Kathiawar region is next to Ahmedabad-Baroda region in chemical industries centred at Rajkot, Bhavnagar and Jamnagar, etc.

Kathiawar region was once the seat of as many as 38 States. Their headquarters, like the district headquarters, flourished as administrative centres. Medium and small-sized towns seem to be uniformly distributed. They function as industrial, commercial, administrative and some of them also as port towns. The rural settlements in greater part of Kathiawar are highly nucleated.

Kathiawar presents varied density patterns ranging from less than 50 to 250 persons per km². Rajkot (194,145), the district headquarters, is the largest city of the region. It is a multi-functional city. Bhavnagar (176,473), the district headquarters, is composed of Bhavnagar municipality (171,039), Bhavnagar Para Railway colony (3,885) and Port Area (1,540). It serves as a port and has air, rail and road links. Jamnagar (148,572), a district headquarters, consists of Jamnagar municipal area (139,692), suburban area (5,190), Army camp (1,472) and Naval establishment at Bedi Bandar (1,150) and Air Force Rozi Camp (1,068). It is well served by roads, rail, airways and also by sea. Porbandar (75,081) has municipal and port area whereas Junagadh (74,298) is the district headquarters of Junagadh. Veraval Town group (60,875) comprises Veraval Municipal area (46,637). Port area (293) and Patan Municipal area (13,927). Ports lying along the coast have developed their own coastal routes. Roads and railways link their restricted hinterlands.

Thus, the Kathiawar region may be divided into three distinct third order regions—*Kathiawar North*, *Kathiawar Core Region* and *Kathiawar Southern Coastal Region*. The Kathiawar North is sparsely populated with the exception of Jamnagar, Rajkot and Surendranagar taluks, while the Southern Coastal region is most densely populated in Kathiawar. The Core region is on the whole moderately populated except the Junagadh taluk which is comparable to Jamnagar in density.

Gujarat Region East

Gujarat Region East consists of plain and high-land rim. The Deccan lavas limit it towards the southwest. To the east, highlands project in the region from the districts of Panchmahals to the Dangs describing the Eastern Hilly region of the second order. The depositional plain emerging from Banaskantha terminates in Surat drained by several rivers. The plain forms homogeneous natural landscape, but its cultural landscape varies to some extent from north to south to define two second order regions: *Ahmedabad region* and *Khambhat region* based on functional differentiation. The uneven terrain of the *Eastern Hilly Region* stands in geonomic contrast to the level and developed regions of Ahmedabad and Khambhat.

Ahmedabad Region : The metropolis of Ahmedabad as the core of the region covers most of Kaira, Banaskantha and Sabarkantha and whole of Mehsana. The Sabarmati, the life-line of Ahmedabad region, divides it into two unequal parts. The Banas, the Saraswati and the Rupen join the Rann. The Bhadar-Bhogowa, Sabarmati-Mahi and part of Mahi-Dhadhar interfluvies define the plain. The Sabarmati levee forms a linear alluvial enclave. The soil is sandy loam except in northern part of Sabarkantha where medium black soils occur. Except in Banaskantha, the annual rainfall ranges between 60-80 cm, while eastern part of Kaira records 80-100 cm. The variability of rainfall exceeds 50% in Banaskantha, while elsewhere it ranges between 35 and 50%. Wells are common whereas tanks also attain significance in Ahmedabad, Kaira and Panchmahals as sources of irrigation. The irrigational projects in the Ahmedabad region include Mahi Right Bank Canal Project, Meshwa Irrigation Project, Hathmati Reservoir Project and Sabarmati Project.

About 70% of the area is under cultivation. Cotton takes second place in Ahmedabad and Sabarkantha, whereas rice is the premier crop in Kaira. Wheat occupies first position in Ahmedabad and second place in Kaira and Mehsana. Sabarkantha leads in maize whereas Mehsana leads in oilseeds.

Ahmedabad region is densely populated. Villages are large and nucleated but their size diminishes in the marginal areas. Ahmedabad district registered over 30% growth in population during 1951-1961. The district shares 60.79% urban population (1961). Ahmedabad and Kaira compose the core of urbanism. Ahmedabad city exercises its influence on 10 towns forming a multiple urban tract. Its urban linear kernel projects up to Baroda city.

In this traditionally textile-oriented region, petro-chemical and allied industries and engineering groups have also emerged. Apart from the metropolitan Ahmedabad (1,206,001), other important towns are Nadiad (78,952), Patan (51,953) and Anand (404,58). The Ahmedabad region can be sub-divided into two third order regions—*Ahmedabad Region East* and *Ahmedabad Region West*, roughly defined by the Sabarmati and in parts by Ahmedabad district boundary. The western part is drier and less urbanized than the eastern counterpart with Ahmedabad metropolis.

Khambhat Region lying south of the Ahmedabad region is also a flourishing region and covers most parts of Baroda, Broach and Surat and some parts of Ahmedabad and Kaira together with Dadra-Nagar Haveli and Daman. It is a depositional plain drained by the Narmada, Tapi, Ambika etc. which form estuaries and cause heavy floods. Deep black soil occurs in the west, while coastal alluvium is confined to the eastern section. Sandy loam prevails in Baroda area. The region in general has an annual rainfall of over 100 cm with some local variations.

Moist deciduous forest occurs in the eastern part of Surat and Broach districts. Agriculture attains a great significance in the alluvial tract of Surat, Broach and Baroda where about 60% of the land is devoted to it. Cotton takes first place in Baroda and Broach and is followed by rice and other crops. Rice is the first crop in Surat followed by jowar and cotton.

Some of the western coastal taluks of Surat command a density of 300 persons per km². The lowest density (50-100) occurs in the south-eastern part and a few taluks near the sea in Broach. Most of the urban areas lie along the

railways near the coast. Surat is the leading industrial district in the region sharing about 16% of the total factories of the State. Surat and Baroda are the chief industrial centres.

The Khambhat region can be divided into two third order regions—*Khambhat Region North* and *Khambhat Region South*; Baroda (298,398), and Surat (288,026) forming their hubs respectively. Broach (73,639), Ankleshwar (20,287) and Cambay (51,291) are other important centres in the north, while Bulsar (37,586), Navasari (53,600) and Daman are important in the south.

Eastern Hilly Region is composed of Panchmahals, eastern parts of Baroda, Broach and Surat and the Dangs. The eastern margin obtains greater altitude, particularly in Dangs where the hills attain an altitude of 600 m. Both, population and economy are mostly tribal. The *Bhils* and *Bhilalas* dominate in the region. The Dangs district has no urban settlement but there are a few towns in Panchmahals. Thus, the region can be divided into three third order units—the *Panchmahals*, the *Narmada-Tapi Tract* and the *Dangs Region*. Godhra (52,167) is the district headquarters and a flourishing town of Panchmahals with manufacture of locomotives and assembly of motor vehicles. Waghar is a small rural service centre in the Dangs where the Bili-mora-Waghar narrow gauge line terminates. In the

Narmada-Tapi tract, which enjoys transitional character between the rather developed Panchmahals and the tribal Dangs region, are Chhota Udaipura (10,829) and Dediapada.

Problems and Prospects

The Gujarat Region, particularly since the formation of the new State, has achieved a considerable progress in different sectors of the economy, yet there are both sectoral and regional imbalances. Though there is relatively low pressure of population on land, the per capita arable land being about an acre, the agricultural yields, particularly of food crops, are much lower, and there is shortage of food and inadequate production of industrial crops. Natural calamities like floods and droughts which often hamper the agricultural sector, could be mitigated by providing better irrigation facilities and power supply in the rural areas through tapping surface as well ground water resources. The industrial development needs more dispersal and diversification, away from the Ahmedabad-Baroda axis. It is needless to emphasize the adjustment of various landuses for food and non-food (mainly industrial) crops. Some of the stupendous problems confronting the region are the reclamation of Rann lands, modernization of the tribal culture and economy and adjustments in the use of river valley resources with neighbouring regions.

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Between the Sahyadris and the Arabian Sea lies the West Coastal Plain Region of India. The region, 1,400 km long and 10-80 km broad, has an area of 64,284 km.² Extending between 8°15'N to 20°22'N and 73°40'E to 77°30'E, the coastal lowland falls into three first order regions : the Konkan, the Karnataka or Kanara and the Kerala or Malabar. Of these, the Karnataka forms a distinct transitional zone between the Konkan and the Kerala. In the north, the region merges almost imperceptibly into the much wider Gujarat plains; its eastern limit is approximately marked by 150 m contour. Included in this region are the coastal lowlands of Maharashtra, Mysore, Kerala and Kanyakumari district of Tamilnadu (Fig. 27.1); the languages spoken in the respective parts are Marathi, Kanarese, Malayalam and Tamil. Bombay is the commercial hub with secondary nodes at Ratnagiri, Panjim, Karwar, Mangalore, Cochin, Quilon and Trivandrum.

Historical Background

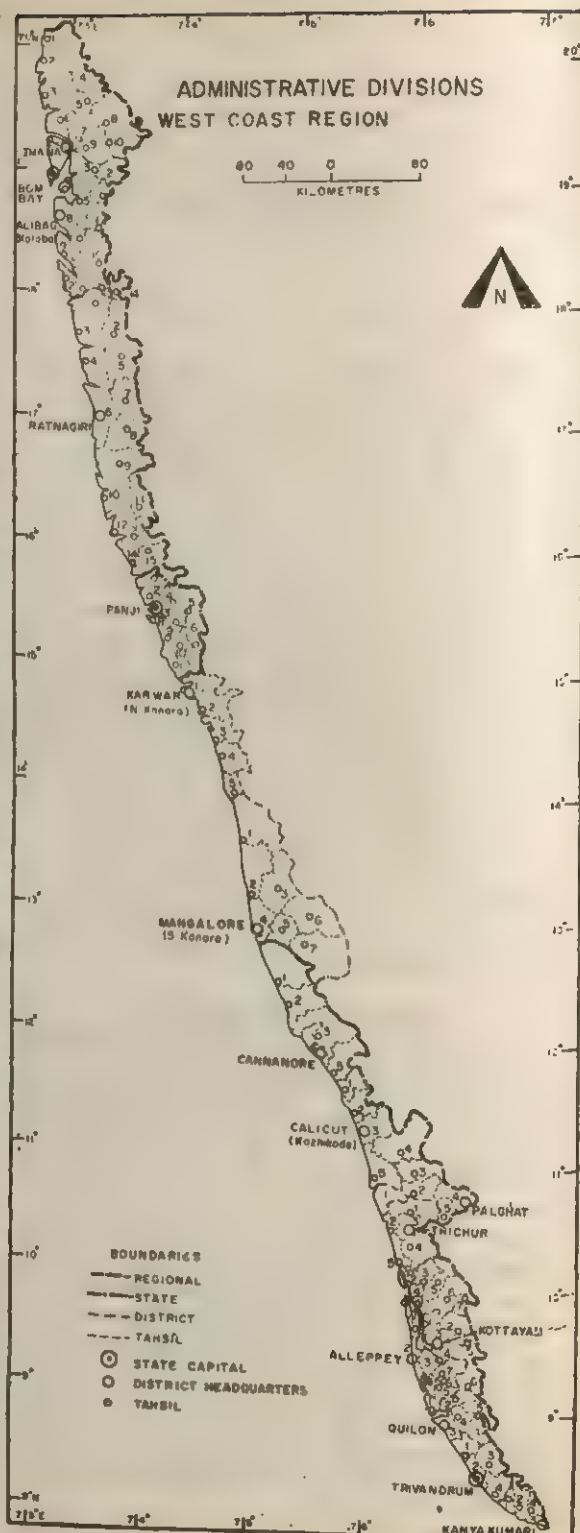
Historically the west coast of India, endowed as it is with numerous havens, creeks and a narrow but fertile hinterland with coveted products, has always been a zone of contact between India and the West. Its location, confronting the sea-lane from western Asia and Europe to the Far East, has not only attracted genuine traders in search of precious merchandise to its coast from the earliest times but has been the cause of many a humiliation at the hands of the deceitful ones so much so that in medieval times, the nation lost its sovereignty, bit by bit, to trading interests with the headquarters at Amsterdam, Paris, Lisbon or London. For the Indian heartland, with seats of power mostly at Patliputra or Kannauj in ancient times and at

Delhi in the medieval times, the region has been a peripheral one; it has been mostly controlled by local rulers since pre-historic to modern age. The interesting fact is that the various parts of this region—the Konkan, the Karnataka and the Kerala, have never been, in the past, under one dominion except for short periods during the reign of the great Mauryan King, Ashoka. It is, therefore, necessary to examine the historical ups and downs of the area on a sub-regional scale.

The port settlements of Ceul, Mahad-chodegarnv and Rajpuri in the Kolaba part of the Konkan date back to the earliest historical times (225 B.C.). Ashoka's edicts, engraved in the third century B.C. at Sopra, Chiplun and Kol caves, indicate that the region then formed a part of the Mauryan empire. After Ashoka, the Satavahanas, Kaniska and Andhrabhritiyas ruled the Konkan. The Shah dynasty of western Kshatrapas which succeeded them were, in turn, overthrown by the Chalukyas who, in 6th century A.D. captured the Mauryan citadel of Puri—'the Goddess of the fortunes of the western ocean'.¹ About that time, the Muslims over-ran the coastal area and established themselves at Dabholi, but the rest of the area was practically unsubdued till the Bahmani kings came into power. About 1500 A.D., the whole of the Konkan, south of the Savitri river, came under Bijapur rule, while the northern Konkan remained under Gujarat Kings. Both the Konkan and Malabar regions carried lucrative trade, with Hormuz in the Persian Gulf, up to the close of the 14th century. The arrival of the Portuguese at the close of the 15th century and their piratical activities greatly affected this trade. By establishing themselves at Cochin and Calicut, and later capturing Bassein and Chaul in

the Konkan, they ousted the Arabs from the lucrative Indian trade. The period of Portuguese ascendancy (1507-1660) preceded the rise of the Angrias, Moghuls, and Marathas. The Moghuls who acquired the sovereignty in 1600, were ousted in 1632 by Shahji Bhonsla (father of Shivaji) who founded the Maratha power. Nine years after Shivaji's death in 1680 the region, once again, went

Fig. 27.1 : THANA DISTT.—*Tabils* 1. Umbargoan, 2. Dahanu, 3. Palghar, 4. Jawhar, 5. Wada, 6. Basscin, 7. Bhivandi, 8. Shahapur, 9. Kalyan, 10. Murbad, 11. Thana and 12. Borivali. KOLABA DISTT.—*Tabils*. 1. Khalapur, 2. Karjat, 3. Panvel, 4. Uran, 5. Pen, 6. Sudhagad, 7. Roha, 8. Alibag, 9. Murud, 10. Mangaon, 11. Mhasla, 12. Srivardhan, 13. Mahad and 14. Poladpur. RATNAGIRI DISTT.—*Tabils* 1. Mandangad, 2. Khed, 3. Depoli, 4. Guhagar, 5. Chiplun, 6. Ratnagiri, 7. Sangameshwar, 8. Lanja, 9. Rajapur, 10. Deogad, 11. Kanakavali, 12. Malvan, 13. Kudal, 14. Vengutla and 15. Sawantwadi. GOA—*Tabils* 1. Pernem, 2. Bardex, 3. Ilhas, 4. Bicholim, 5. Satari, 6. Sanguem, 7. Ponda, 8. Marmagao, 9. Salsette, 10. Quepem and 11. Canacona. NORTH KANARA DISTT.—*Tabils* 1. Karwar, 2. Ankola, 3. Kumta, 4. Hanovar and 5. Bhatkal. SOUTH KANARA DISTT.—*Tabils* 1. Coondapoor, 2. Udupi, 3. Karkal, 4. Mangalore, 5. Buntwal, 6. Belthangady and 7. Puttur. CANNANORE DISTT.—*Tabils* 1. Kasargod, 2. Hosdurg, 3. Tali-parumba, 4. Cannanore and 5. Tellicherry. KOZHIKODE DISTT.—*Tabils* 1. Badagara, 2. Quilandy, 3. Calicut, 4. Manjeri and 5. Tirur. PALGHAT DISTT.—*Tabils* 1. Ponnani, 2. Ottapalam, 3. Perinthalmanna, 4. Palghat and 5. Alathur. TRICHUR DISTT.—*Tabils* 1. Wadakkancherry, 2. Trichur, 3. Chowghat, 4. Irinjalskuda (Mukundapuram) and 5. Changanore. KOTTAYAM DISTT.—*Tabils* 1. Vaikom, 2. Palai, 3. Kottayam, 4. Changanacherry and 5. Kariappally. ERNAKULAM DISTT.—*Tabils* 1. Cochin, 2. Parur, 3. Alwaye, 4. Emakulam, 5. Perunbavoor, 6. Muvattupuzha and 7. Thodupuzha. ALLEPPEY DISTT.—*Tabils*, 1. Shertalai, 2. Alleppey (Ambalapuzha), 3. Pulincunnu (Kuttanad), 4. Haripad (Karthigapalli), 5. Mavelikkara, 6. Chengannur and 7. Thiruvalla. QUILON DISTT.—*Tabils* 1. Karunagapally, 2. Adoor, 3. Quilon, 4. Kottarakara, 5. Punalur and 6. Pathanamitha. TRIVANDRUM DISTT.—*Tabils* 1. Attingre, 2. Trivandrum, 3. Medumangad and 4. Neyyatinkara. KANYA KUMARI DISTT.—*Tabils* 1. Vilavancod, 2. Kalkulam, 3. Thovala and 4. Agasthiswaram (Nagarcoil).



under the control of the Moghuls. The period of Angrias who terrorized the coast while the Muslims were powerful inland, lasted for 150 years (1690 to 1840) when Kanhoji died in infancy and the region was taken over by the British.

Goa, historically, forms a different territory. In ancient times, it was known as *Gomanchala*, *Gomant*, *Goapuri*, *Goakapur* and *Gopakapalanua*. Mention is made in the 'Sahyadri Khand' of the *Skand Purana* that the Aryans settled in Goa, after they were brought by Parasuram from Trihotrapur or modern Tirhut.² At a much later date, Goa passed into the domain of Kadambas of Banavasi (A.D. 120). This dynasty continued to rule until 1312 when Goa fell, for the first time, into the hands of the Muslims under Malik Kafur. They were, however, forced to evacuate it in 1370 after their defeat at the hands of Vidyaranya Madhav of Vijayanagar. In 1470 it was captured by Mahmud Gawan, one of the generals of the 13th Bahmani Sultan of Deccan. Goa became subject to the Adil Shahi dynasty reigning at Bijapur, about 1498, and remained under it till 1510 when Alfonso de Albuquerque captured it. From this time, Goa rapidly rose in importance. In 1543, Ibrahim Adil Shah had to cede two important districts or *mahals* of Bardez and Salsette to the Portuguese. The Dutch in 1603 and the Marathas in 1683 attacked Goa but were forced to withdraw. At this time, the Portuguese conquered the islands of Corjium and Ponelem from the Bhonsle. Shortly after 1741, however, the Bhonsles renewed hostilities, but were defeated by the Portuguese Marquis of Castello Novo, who conquered Alorna Tiracol, Neutim, Patim and Sanquelim or Satari. The whole territory remained under the Portuguese till 1961 when it was liberated to form a part of the Republic of India.

The Karnataka coast, as appears from numerous inscriptions, has been controlled successively by the Kadambas of Banavasi, the Rattas, the Chalukyas, and the Yadavas till the 12th century when it was over-run by the Hoysala Ballalas of Darasamudra who were banished by the Muslim rulers of Delhi. In the 14th century, the region passed

into the hands of Vijayanagar Kingdom. Vasco da Gama landed on one of the islands of Udipi in 1498; thus, the first Portuguese settlements on the west coast were established by the close of the century. With the sack of the capital city of Vijayanagar in 1505, the local chiefs of Kanara became independent. The Muslims, later, attacked the Portuguese settlements on the coast, but were unable to subdue them. Till the ascendancy of the Marathas in 1675, the Kanara was under Bijapur sovereignty, but after the fall of the latter the region passed into the hands of Aurangzeb. The Marathas, once again, held this region in 1700 but by 1763, it passed into Haider Ali's domain. In 1789, it was annexed by the British after the defeat of Tipu Sultan. Thus, it continued to be a part of British India until 1947.

The Malabar region, also known as "Parasuram Kshetram", according to the Puranas, was reclaimed from the sea by the Brahmin warrior, sage Parsu Raman or Parasurama. In the dim centuries preceding the Christian era, the ports and trading centres of Cranganore, Quilon, Cochin, Calicut, Kadalundi, Cannanore and Dharmadam on the Malabar coast had trade relations with Egypt, Asia Minor, the Assyrian and Babylonian empires, the Greeks, the Romans and the Chinese. Brisk trade was also carried on with the Malayan Peninsula, the Philippines, Java and Sumatra. Ships from the East and West, laden with gold, came to the ports of Kerala and traded gold for the spices, ivory, sandalwood, peacocks and other local products.

Reference to Kerala or Malabar coast is found in an inscription of Ashoka. Little is known thereafter until the beginning of the 9th century A.D., when the various groups of the Malayalam-speaking people joined hands and founded a new era, the Kollavarsham era in August 825 A.D. This era is still followed by the masses in the observance of religious rites and cultural festivals. Unfortunately, this unity was short-lived. Internal strife and feuds soon forced them to entrust their sovereignty to a noble man from outside, Cheraman Perumal by name, who founded the Chera dynasty in the middle of the 9th century. Economic and cultural decadence set in with the

end of the Chera dynasty so that traders from the west and Muslim invaders found it easier to subjugate the local people. Not much is known about the subsequent history until the arrival of the Portuguese at Calicut in 1493 and at Cochin Port in 1502. The Zamorins of Calicut, who had undisputed sway over Northern Malabar, managed for a long time to keep the Portuguese invaders and sea pirates at bay, by enlisting the support of the Arabs. In A.D. 1776, the region went into the domain of Hyder Ali. With the fortune favouring the British, the ruler of Cochin owed allegiance to the East India Company in 1791 and Tipu Sultan ceded Malabar in 1792. Travancore also became a tributary to the Company by making an annual payment of Rs. 8 lakhs according to the revised treaty of 1805. This arrange-

ment continued until 1947. It was followed by the reorganization of Cochin, Travancore and Malabar into the State of Kerala in 1956. The Kanyakumari part of the erstwhile Travancore State, forming a part of the region, was transferred to Tamilnadu (Madras) under the reorganization.

The Physical Setting

Physiography

Physiographically the region is a distinct strip of lowland, interspersed by hills, rising in elevation from the sea level to 150 m and, at places, to more than 300 m (Fig 27.2). It is composed of one or more of the following elements of the landscape : sandy beach, coastal sand dunes or mud flats, alluvial tracts along rivers or lagoons or estuary, laterite platforms, erosional surfaces in the hard

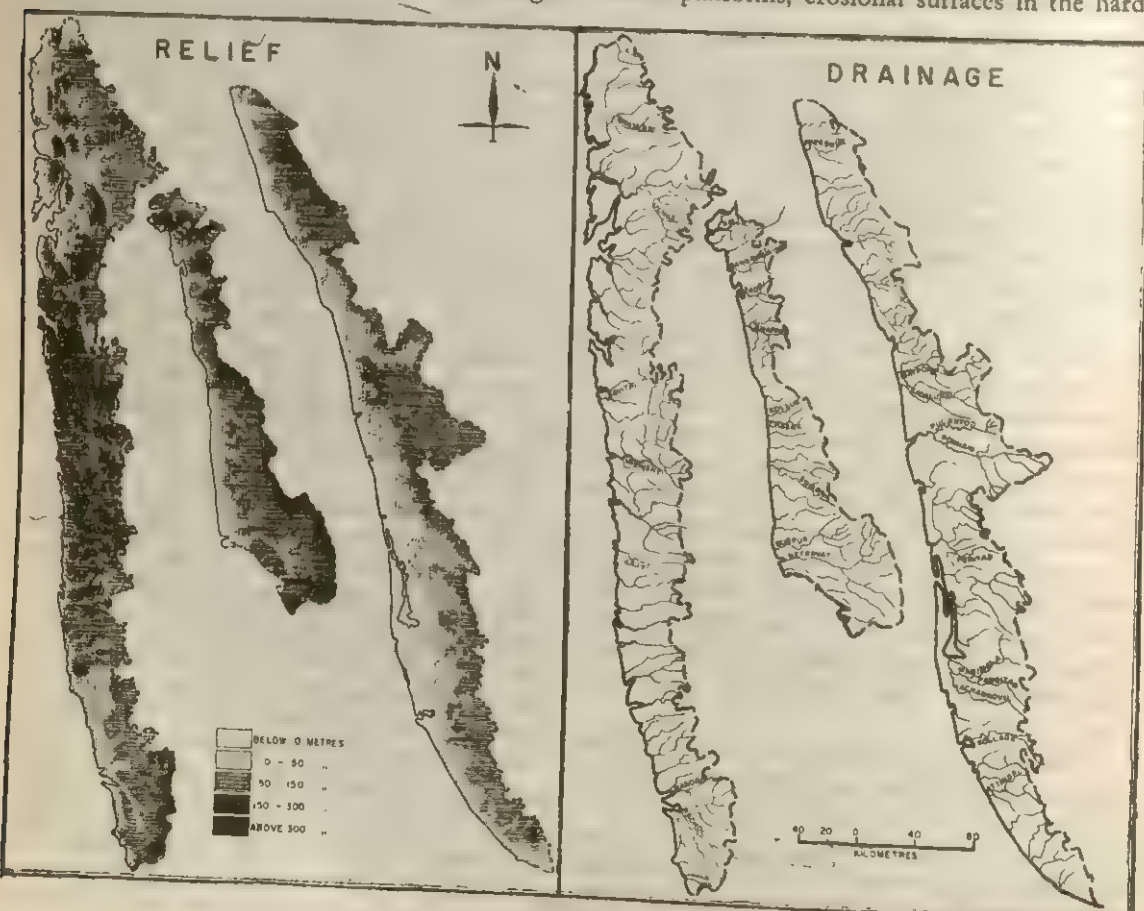


Fig. 27.2

basement rock or the residual hills. The Sahyadris, rising in elevation between 760 m and 1,220 m, run almost continuously parallel and present their steep face to the lowlands. Its continuity is interrupted by the presence of a few ghats or gaps, like the Thal and Bhore, which have been used by the railways to connect the port and city of Bombay with the interior. Also in the south, the railways use the Pal Ghat gap to connect the Malabar coast with the Tamilnadu country. Other gaps of lesser importance have been used by motorable roads to link the western coast region with the interior of the Peninsula.

The steep west-facing scarp of the Sahyadris, according to some geologists, is the product of faulting which preceded the subsidence of the Arabian Sea block between India and Africa at the close of the Eocene period. If we accept this view, the western coastal lowland, and the sediments composing it, are of very recent origin, ranging in age from Pliocene to Recent times. An examination of the coastline from north to south reveals recent submergence in the Konkan and Karnataka and emergence in the Malabar (from Mangalore to Kanyakumari). Mention may be made here of the discovery of submerged forests on the eastern coast of the island of Bombay, besides the drowned nature of the streams (with wide estuaries) both here and on the Karnataka coast.

Raised beaches and planes of marine erosion of earlier times are found at altitudes varying from 30 to 91 m all along the western coast of India. "A common type of raised beach is the littoral concrete composed of an agglutinated mass of gravel, sand with shells and coral fragments".³ Occurrence of bevelled surfaces in Deccan lava, surmounted by isolated hills that look like offshore islands, has been noted in the Konkan. Platforms of marine erosion are also found in the Karnataka at an elevation of 60 m. Besides, presence of a series of laterite-capped residual plateaus have been observed at 76 m in southern Ratnagiri district of southern Konkan, as also extensively on the Karnataka and Malabar coasts.

The undulating lowlands of the Konkan are 530 km long and 30 to 50 km broad. These are

widest near Bombay, in the amphitheatre-like basin of the Ulhas which has forced the Sahyadris in this part to recede inwards away from the coast. Numerous hills and detached ridges dominate the lowlands in the area. Flat shores, with long sandy spits running into muddy shallows, are found north of the Vaitarni river. Thus, two aspects characterize the landscape in the northern Konkan. These are : (i) the sandy spits intruding into muddy shallows close to the sea; and (ii) low coastal ranges alternating with longitudinal valleys farther inland.

The southern Konkan, in contrast, is a rocky and rugged country. Lofty hills and elevated plateaus, intersected by numerous creeks and navigable streams, are found close to the coast. The sea-board from Bankot or Fort Victoria to Reddi Fort is rocky. Farther inland, trap rocks form rugged hills, 60 m to 100 m high; these hills rest on peneplaned Kaladgi quartzites which before peneplanation formed symmetrical anticlines.⁴ Rocky projections from the Sahyadris almost reach the sea-board both north and south of Goa. But, the coast around Goa is more deltaic than anywhere else in this part; it is characterized by wide estuaries and is of the ria type.

In northern Karnataka, the lowland becomes so narrow that it is confined to small pockets along the lower courses of the streams. Conical hills, composed of gneiss and about 610 m high, again reach the coast south of Karwar. Farther south, the lowland is somewhat wider in southern Karnataka; its maximum width is about 70 km near the port town of Mangalore in the Netravati Valley.

Occurrence of three roughly parallel belts of landforms has been noted in the Karnataka coastal plain region. Immediately behind the coast is a relatively narrow belt of very recent deposits, forming sand dunes, lagunar or estuarine mud-flats or marshes and valley plains. It is generally flat or gently sloping and has an average elevation of 30 m. This belt is succeeded by a 61 m high erosion platform farther inland. The erosion platform is 25 km wide in the south; it is well dissected by steep-sided valleys. Associated with this surface are the laterite deposits of Pliocene age.

Often a cliff marks the break in slope between the belt of very recent deposits and the 61 m high erosion platform. Farther inland lies the third belt of isolated hills, 91-305 m high. These residual hills of Archaean gneiss constitute a conspicuous aspect of the landscape southeast of Hanover and near Karwar.

The Malabar coast is 550 km long and 20 to 100 km wide. It is narrower in the north and south and wider in the middle section. Its maximum extension is found in the valleys of the Beypore, the Ponnani (which drains the Palghat gap), the Periyar and Pamba-Achankovil rivers. In the south, it terminates near the rocky projection at Kanyakumari. The belted arrangement of landforms is also a characteristic feature of the Malabar coast; they appear here on a larger scale. The prograding aspect of the Malabar coast is also very obvious. Sand dunes of a peculiar form, locally known as *Teris*, are found almost all along the Kerala coast, except south of Kovalam (14 km south of Trivandrum) where the rocks project right up to the sea. These dunes of Pleistocene and Recent times have helped to form a large number of shallow lagoons and backwaters which are locally known as *Kayals*. The backwaters constitute an important physical feature of the Malabar coast. Low laterite plateaus and foothills occur east of the alluvial coastland. The laterites are associated with the Warkalli beds of Pliocene period. Two erosion surfaces, probably representing former planes of marine erosion at 76 m and 183 m are found in the laterites. Occurrences of laterite cliffs have been also noted at 40-46 m in Kozhikode district. The gneissic hill country lies farther inland.

Drainage

The drainage of the region is carried by numerous short and swift flowing streams which have carved deep valleys on the west-facing slope of the Sahyadris (Fig. 27.2). They generally run parallel to one another and flow in a westerly direction until they drain into the Arabian sea. Several of these have tortuous courses with steep gradients right up to the sea. Their initial development seems to have taken place as consequent streams

on the western fault-face of the Sahyadris; these were later extended over the lowlands which are geologically much younger.

The most important streams of the northern Konkan are the Vaitarni, the Ulhas and the Amba. The Ulhas, with a course of 130 km is the largest river of the Konkan coast. It rises in the ravines of Bhore Ghat and forms an amphitheatre-like basin near Bombay, before discharging into the sea north of Salsette Island (Bassein Creek). The lowland, in this part, is 95 km wide south of Bombay, the coastal plain narrows and, with it, the streams become shorter. The larger ones among them—the Savitri and the Vashishthi, have also formed amphitheatre-like basins under the Ghats. Farther south, in Goa and on the north Karnataka coast, the streams, Kalinadi, Gangavati-Bedti, Tadri and Sharavati (or Gerosappa River), have encroached upon the Krishna-Tungabhadra drainage, thus, pushing the watershed some 130 km back from the coast instead of the usual 40-55 km.⁶ But the streams have carved out narrow valleys with steep gradients because the coastal lowland is the narrowest in this part, being confined to strips along the lower reaches of the rivers. Small port settlements such as Karwar on the Kalinadi and Hanover on the Sharavati, are sited at the mouth of these streams. The most important stream in south Karnataka is the Netravati at whose mouth is located the port town of Mangalore. These streams, being turbulent, permit navigation for short distances near their mouths. However, floating of logs is a common practice.

The Malabar coast has a large number of streams; the Periyar, having a length of 230 km, is the longest. But most of the streams are very short; their average length is only 60 km. Only 4 rivers—the Beypore, Bharatpuzha, Periyar and Pamba, are more than 160 km long. The rivers of Kerala region have a total run-off of 2,500 thousand million cubic feet, i.e., 5% of India's water potential.⁶ They serve as important arteries of inland communication and provide a vast potential for hydroelectric generation and irrigation. Lakes and backwaters characterize the greater part of the Malabar coast. These backwaters are connected with man-made canals. Thus, an uninterrupted

PLATE XVII



A view of the Vivekanand Rock, Kanya Kumari



Paddy fields flanked by coconut palms is the typical landscape of the alluvial valleys in Kerala low lands



Tribal people returning from forest in Car Nicobars



An Onge family of Little Andaman

system of inland communication has been developed for a distance of 450 km between Trivandrum and Badgara in the north. The Vembanad Lake, stretching from Alleppey to Cochin and having an area of 205 km² is the largest water basin of the area. In all, the Malabar has more than 2,000 km of navigable waterways which is about 20% of India's total length of waterways.

Climate

The Region enjoys an equable climate with high temperatures almost throughout the year. Its mean monthly temperature ranges between 24°C and 31°C; the maximum temperature rarely exceeds 32°C and the minimum rarely falls below 21°C. The highest temperature recorded on any one day in the last 80 years is 40°C in the Konkan. The daily range in temperature is about 10°-14°C in the winter and summer months and about 3°-6°C in the rainy season. The annual range decreases southwards from 5.7°C at Bombay to 5°C at Karwar, 4°C at Mangalore and 3.3°C at Cochin. April and May are the hottest months of the year. High humidities and refreshing on-shore breezes, particularly in the afternoon and evening, are typical of the region (Fig. 27.3).

The rainfall is uniformly high, being 280 cm in the Konkan, 310 cm in Karnataka and 240 cm in Kerala. About 80 per cent of the annual rainfall in the Konkan and North Karnataka is received during 4 months from June to September. The length of the rainy season increases towards the south from 4-5 months in the Konkan and North Karnataka to 7 months near Mangalore and 8-9 months in Kerala. The rainfall, in Kerala, decreases from 300 cm in the north to 160 cm at Trivandrum and 100 cm at Kanyakumari. It is, however, distributed throughout the year as there is precipitation from both the monsoons. A double maxima of rainfall—a primary maximum in June-July and a secondary one in October-November is therefore typical of Kerala coast.

Seasonal Variation : The cool season extends from December to February. It is a period of low humidities, bright sunshine and little precipitation. In December, there is a fall in tem-

perature in the north, but there is little change in the south. The mean temperature in January ranges between 24°C in the north and 28°C in the south. With an appreciable decrease in night temperature, the daily range in January is at its maximum (13°-14°C). The mean temperature decreases in February. This decrease is largely due to fall in the mean maximum daily temperature. As the night temperature remains the same as in January, the daily range is reduced to about 9°C in February.

An increase in the mean temperature in March indicates the approach of the hot season. Light sea-breezes characterize the period between March and May. The "mango showers" or the pre-monsoon rains of April-May are particularly important in Kerala and South Karnataka. It results in a decrease in the daily range in temperature towards the south.

The onset of the southwest monsoon in the first week of June in Karnataka and Konkan is associated with the development of cyclonic storm in the Arabian sea. A fall in the mean monthly temperature, by 3°C to 4°C, takes place with the outbreak of the monsoon. July and August, with a rainfall of over 60 cm each, are the rainiest months. There are at least 15 to 20 rainy days in each of the months from June to September. At Bombay, a maximum rainfall of 55 cm has been recorded on one single day (10-9-1930); its hourly intensity has been as high as 13 cm. But, in spite of the heavy rainfall, the coefficient of the variability of rainfall in the region is as great as in the interior of the Peninsula.

The mean temperature in the southwest monsoon period is about 25°-26°C. In October, with withdrawal of the monsoon from Konkan and Karnataka and its slackening in Kerala, the mean temperature rises again to 27°-28°C. Very strong winds, sometimes reaching gale force, are associated with the cyclonic storms, originating in the Arabian Sea, in the post-Monsoon period. Both the Konkan and Karnataka coasts are affected by these storms. The highest wind speed recorded, during one such storm, was 129 km p.h. at Colaba and 151 km p.h. at Juhu in November, 1948.

Soils

There are 7 major types of soils in the region. They occur in belts parallel to one another along the coast and are closely associated with both the physiographic units and the geological formations. The soils are: (i) Sandy soil, (ii) Alluvial soil, (iii) Coarse sandy soil,

(iv) Laterite or Red soil, (v) Peaty soil, (vi) Black soil, and (vii) Forest soils. Of these, the alluvial and black soils are most fertile (Fig. 27.3).

The sandy soil is found close to the seabeach throughout the region. The soil, in Karnataka is often associated with alluvium and

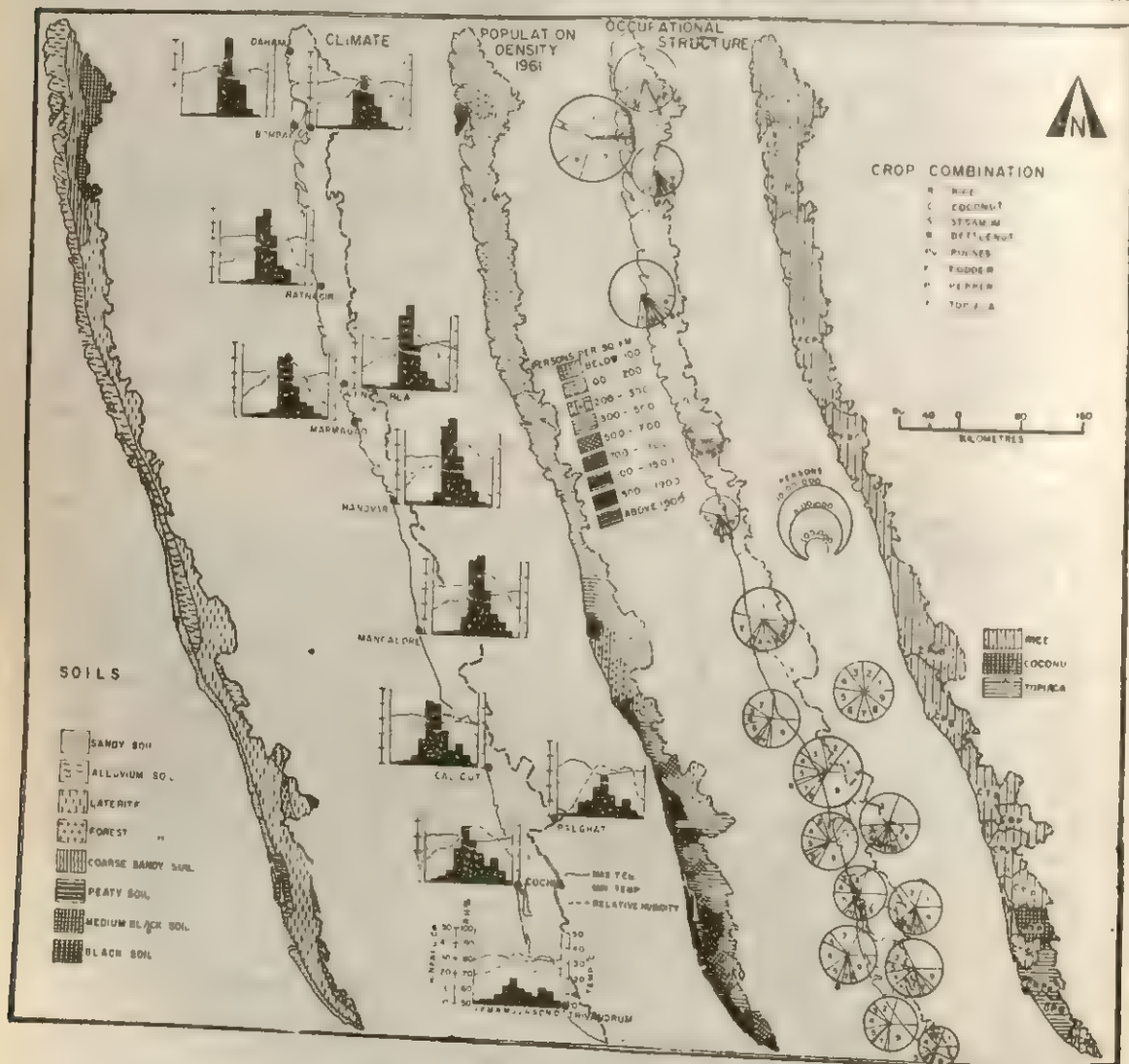


Fig. 27.3

INDEX : OCCUPATIONAL STRUCTURE— 1. Cultivator, 2. Agricultural labourer 3. Mining Quarrying, livestock, forestry, fishing, hunting, plantations, orchards and allied activities, 4. Household Industry, 5. Manufacturing other than household industry, 6. Construction, 7. Trade and commerce, 8. Transport, storage and communication and 9. Other services

outwash materials from the parent laterite. In Kerala, it is associated with the sand dunes along the sea-beach and sandy islands of the backwaters. The sand, in this part, is mostly marine in origin. The soil is generally saline, low in organic content and extremely deficient in nitrogen, phosphorus, potash and calcium. It is, therefore, of poor fertility status.

The alluvial soil, besides river-alluvium, also includes lagunar or estuarine mud and silts, particularly in the Konkan. It is one of the most fertile soils of the region, forming a wide belt in the North Konkan. The belt becomes narrower towards the south in the South Konkan until it almost disappears in North Karnataka where its occurrence is localized to the lower sections of a few streams. It again appears as a belt between the sandy and laterite soils in South Karnataka where it is widest in Netravati Valley near Mangalore. In Kerala, it occurs in the valleys of Pamba-Achankovil rivers, forming a pocket between the sandy soils of the coast and laterites of the midlands. Mention may be made here also of the *Kole* soils in Trichur and Mukundapuram Taluks which are fertile alluvial soils, formed mostly *in situ* from micaceous and granitic rocks.

The coarse sandy soil of the *Varkas* of higher ground occurs east of the coastal alluvium in the North Konkan. It is also a saline soil associated with low hills and plateaus in the area.

The laterites or red soils are found east of the sandy and alluvial tracts throughout Kerala and Karnataka and as far north as Khod (a little north of Vashishthi river) in the South Konkan. These are associated with platforms of marine denudation, 60-125 m high, as in Kerala and south Karnataka, and the low-lying plateaus and residual hills in North Karnataka and south Ratnagiri; their maximum width is found near Palghat gap and in the middle parts of Netravati Basin. The laterite soil is often gravelly and sandy, containing only a very low proportion of clay. It is, therefore, free-draining and thirsty. Both the laterite and red soils are highly acidic, rich in iron, aluminium, titanium and manganese oxides but poor in lime and organic content. Consequently these are either sterile or of poor fertility status.

Only crops like cashew, mango and tapioca can grow on them.

Peaty or *Kari* soil is found in pockets, east of the backwaters, in the taluks of Ambalapuzha, Kuttanad, Vaikom and Shertallai in Kerala. It occurs at the junction of the sandy and laterite soils. A small patch is also marked in similar disposition in the middle course of the Ponnani. The soil is black and heavy and rich in organic matter (10%-40%) and potash. But its high acidity, besides presence of iron and aluminium salts, makes its reclamation difficult.

The black soil or the *regur* is associated with Trap rocks in the North Konkan. It occurs as far south as Mahad in the region. The soil is very rich in iron, magnesium and calcium but poor in nitrogen. It is a very fertile soil with a high moisture-retaining capacity.

The forest soil is found in patches on the slopes of the Ghats in Palghat, Kozhikode and Cannanore districts.

Vegetation

The vegetation of the Region consists of coconuts or casuarina on the saline sandy beaches and in the backwater zone, mangrove and swamp vegetation in marshes, creeks and estuaries, scrubs and bamboo on the low laterite platforms or hills, and moist deciduous or tropical evergreen forest on higher slopes of the Sahyadris. Though the palms grow almost all along the coast, these are most prolific in Kerala and South Karnataka. The highest density of palms on the coast is found in the Kozhikode district. Mangrove and swamp vegetation is typical of the marshes, tidal creeks and estuaries of the Konkan and North Karnataka coasts.

Much of the natural vegetation of forests, moist deciduous and tropical evergreen, has been removed a long time back; it has been either reclaimed for agriculture or replaced by plantations. Nevertheless, patches of dense forest are found, at present, in North Karnataka, and on the transverse ridges and isolated hills of the South Konkan, and on the eastern slopes of the Ghats in Kerala. Some of the best teaks are obtained from the forests of the North Karnataka

coast. The laterite-capped hills or plateaus in the South Konkan, Karnataka and Kerala are mostly sterile and, inspite of heavy rainfall, provide a vegetation of scrubs, bushes and bamboo only.

The Cultural Setting

Population

The Region with a total population of over 25 million, exhibits an average density of about 394/km². The main concentrations are, however, in the alluvial pockets dominated by paddy cultivation, as also around urban centres like Bombay, Mangalore, Ernakulam and Trivandrum. Regionally, the Malabar coast has the highest density (about 700) and Karnataka coast, the lowest (about 200). Sub-regionally, the patches and ribbons of sparse population occur in Ratnagiri and N. Kanara. Extremely higher pressure of population (over 1,000/km²) are, however, exhibited by Chowghat, Cranganore, Parur, Knayanur, Cochin, Ambalapuzha, Karthigapally, Quilon and Trivandrum taluks of Kerala low lands. Cochin Taluk has the highest density (2,228) (Fig. 27.3).

There is considerable proportion of urban population in the Region (31.5%), which varies from 8.9% in Ratnagiri to over 30% in Thana; Greater Bombay has practically no rural population. Karnataka coast is the least urbanised as compared to its northern and southern counterparts. Over 50% of the urban population is concentrated in Greater Bombay alone. Malabar coast with its 5 Class I cities accounts for about 34% of the urban population of the Region.

Only 37.4% of the total population is enumerated as workers in the region. It is notable that in Malabar coast the proportion of workers is lowest, varying from 30.6% in Kozhikode district to 38.8% in Palghat. In Karnataka the percentage of workers rises to about 45 while in Konkan it is the lowest in Greater Bombay (40.6) and highest in Thana (47.0).

Sub-regionally agriculture appears as dominant occupation in Ratnagiri (75%) and Kolaba (66), while it varies from less than 1 (Greater Bombay) to

46% (Kanara) and 49% (Thana). Manufacturing provides maximum employment in Greater Bombay (39.4%) followed by Quilon (16.9), Ernakulam (12.7), Cannanore and Thana (10.3 each). Plantation, fishing, forestry, mining, etc. group is significant in Kottayam (25.2), N. Kanara (12.3) and Kozhikode (11.7). Trade-commerce (18) and Transport (11.2) are very important in Greater Bombay. In household and cottage industrial employment notable districts are Kanyakumari (21.8), Alleppey (17) Trivandrum (11.3) and Trichur (9.6) (Fig. 27.3).

The sex ratio, in general, is higher (1,002), varying from 663 (Greater Bombay) to 1,237 in Ratnagiri. It is also appreciably high in Palghat (1,086), S. Kanara (1,082), Goa (1,070) and Kolaba (1,058). Elsewhere it varies between 919 (Thana) to 1,035 (Cannanore).

The trend of growth during 1901-61 exhibits distinct spatial patterns : while Malabar coastal districts have shown extremely high growth (120-300%), most of Konkan and N. Kanara districts record low growth (30-60%). It is striking to note that with very high density South Malabar has registered the maximum growth (180-300%), while Goa shows the lowest growth (less than 30%) during the same period, perhaps partly due to Portuguese rule over a considerable period and partly due to out-migration of Goanese people. The trend during last decade shows that parts of South Malabar (Alleppey) have almost reached the saturation point showing comparatively lesser growth rate (15-20%) than its adjoining districts—Quilon (31.7), Trivandrum (31.38), and Kottayam (30.5). In Karnataka and Konkan coast the same trend continues except in Greater Bombay (38.6), Thana (28.9) and N. Kanara (33.2). The lowest growth rate in this decade is exhibited by Ratnagiri (6.7) and Goa (less than 10).

Sample Villages

Halge⁷ (below 2,000), a typical medium-size village of North Kanara lowlands, lies about 19 km northeast of Karwar on the Karwar-Belgaum road (Fig. 27.4). It is located on the creek of its name. Its area of 554 hectares contains

some of the best paddy lands of the lower Kali basin. A plain of deposition, flanked by residual

of the arable land; rest of the arable land is known as *gazini* or *makki* land, given to coarse paddy cultivation. The population is distributed in 7 hamlets (Fig. 27.5).

*Agarsure*⁸ (1,018;1951) is a typical rural settlement of the Konkan coast, having a creek-side location (Alibag tahsil, Kolaba), 34 km from Bombay. It is a rain-fed paddy growing village. Sonkolis (635) and Chankalshis (282) are the leading communities; the former combine agriculture with fishing while the latter are predominantly agriculturists. Of the total area of 294 hectares about 45% is arable, and over 90% of the arable land is under paddy. The entire population is distributed in 8 hamlets, associated with main castes and sub-castes; Mul-gaothan and Salechpada (hamlet) are the two largest ones.

Selected Cities

Bombay : The port city of Greater Bombay, the capital of Maharashtra State, is the premier metropolis of India and the biggest rival of Hooghly-side as a production centre. Located on the commercially active Konkan littoral across the Sahyadri it is easily approachable through the Ulhas basin leading to Thalghat and Bhorphat. The city enjoys the 'western gateway of India' significance (Fig.27.).

Bombay derives its name from *Mumba Devi*, the goddess of the aboriginal *Koli* fishermen. From the Hindu chiefs it passed in 1348 to the Sultans of Gujarat and then to the Portuguese in

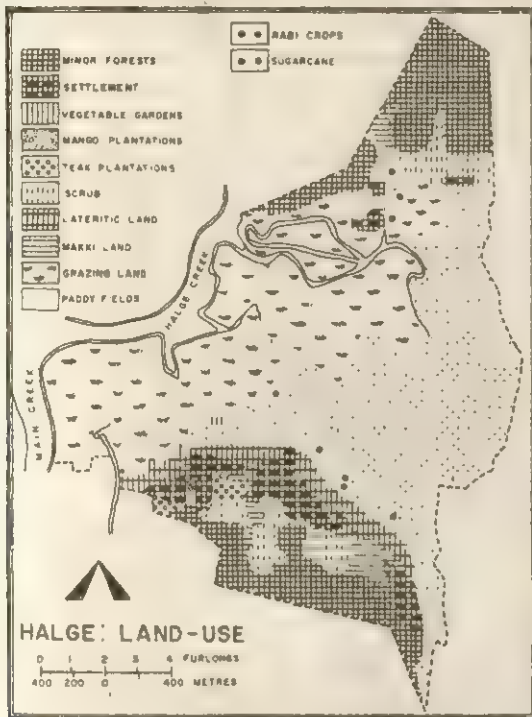


Fig. 27.4

hills (bearing laterites and mostly forested) both in the north and the south, constitute the salient aspects of its topography. A part of this plain is liable to flooding by the Halge creek. Better class paddy lands account for about 50%

VILLAGE AGARSURE MORPHOLOGY

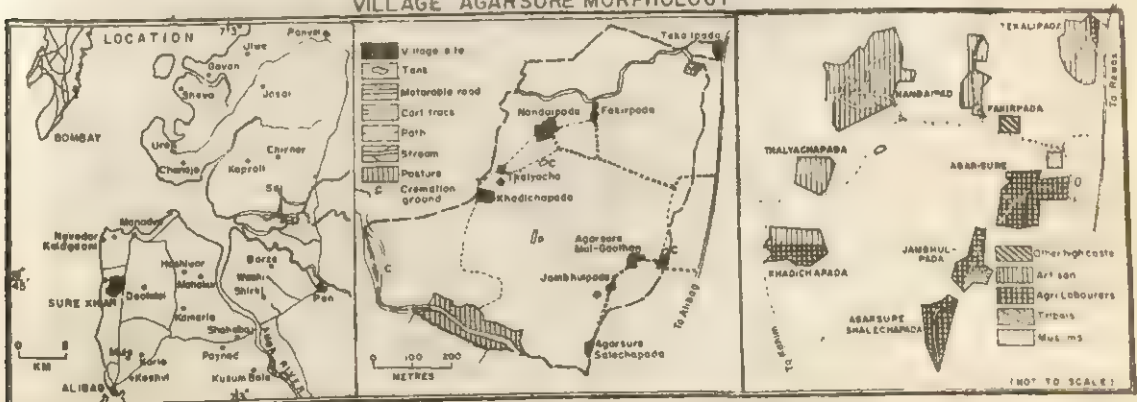


Fig. 27.5

1534, who ceded the territory to the British crown as dowry in 1661 and it is since then that its real development started. The original 7 islet site of Deccan Lava was developed to form the Bombay island, later extended up to Bassein creek to include the Salsette island.



Fig. 27.6

On the southern extremity of the Bombay island lies the magnificent backbay overlooking which on the NW is the famous Malabar hill, a rocky ridge about 60 m high. The hill contains the Rajbhavan (Governor's house) and is the prize place of the Bombay gentry. On the protrusion to the other side of the bay is the world famous marine drive, the multilane highway along side the coast, backed by the imposing residential blocks. The Fort area in the background contains great public buildings, such as the Victoria

Terminus and the Gateway of India as also the business, shopping and banking establishments. The Kolaba at the southernmost tip contains the military headquarters. The Patel and the Majhgaon area are the important industrial sections. Greater Bombay with a population of 4,152,056 (1961) covers over 482 km² area. With all its vices of industrialism, it is one of the world's most cosmopolitan and dynamic cities containing multi-religious and multilingual Indian people and sizeable number of various other nationalities, having institutions of regional, national and international importance.

Bombay industries include cotton textiles, engineering, wool, leather, chemical, oil, drugs, food, film and various other metropolitan industries. The fast developing petrochemical complex, fertilizer and atomic power installations speak of its high prospects.

The city has India's largest natural deep water harbour and a large well-equipped modern port.

Mangalore : A prominent industrial city and port in south Kanara, is situated at the confluence of the Gurpur and the Netravati rivers (Fig. 27.7). A sand spit, about 5 km long, shelters the port in the backwater of the Gurpur. The entry to the port is through the Gurpur which breaks through the sand spit at its southern extremity. Ships with a draught of over 3.5 m anchor in the open roadstead, about 4 km from the wharf; vessels of lesser draught enter the port at high tide and anchor safely in the backwater behind the sand spit. Small vessels or steamers move the cargo between the ships in the open roadstead and wharves in the inner harbour. Ships upto a draught of 10 m will reach the harbour with the development of the deep-sea port at Panambur, about 9 km away from the present port. Mangalore at present remains closed to shipping during June-September due to the ferocity of the monsoons. In these months it receives a rainfall of 297 cm. In 1964-65, about 3,000 coastal sailing vessels, 99 steamers and 90 foreign vessels visited the port of Mangalore.

Mangalore is a Portuguese corruption of Mangal-pura or Mangaleru, which was the name of the

city until 14th century. It is locally known as *Kudala*, meaning the meeting place of two rivers. This port town was known to the early Chinese and Arab traders. In 1871, it had a population

of 29,712 and an area of 3.63 km². The town, then inhabited mostly by traders, fisherfolk and agriculturists, spread in a ribbon-like pattern along the Gurpur and Netravati rivers. Its

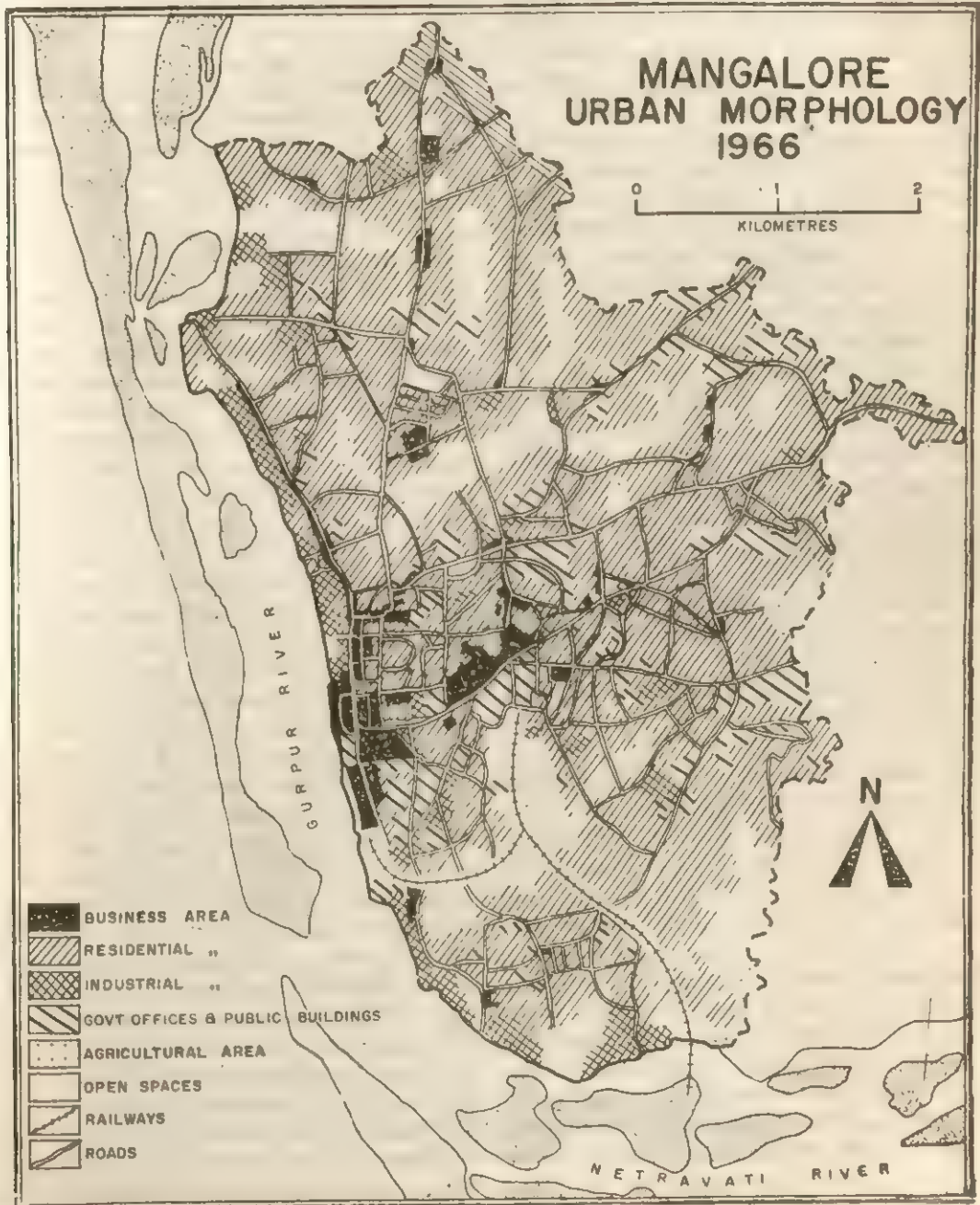


Fig. 27.7

population, in 1901, increased to 44,108 and area to 9.17 km². The town grew slowly in the first 3 decades of the present century; its subsequent growth has been rapid. During 1931-41, its area increased from 13.45 km² to 20.46 km² and population from 66,256 to 81,069. The population, since 1941, has risen rapidly but the area only marginally. Its population in 1961 was 142,669 and area 21.7 km².

The location of Mangalore on the spur-sted, in the fork of the Gurpur and Netravati rivers, initially produced a triangular shape. Up to the end of the 19th century, the city had a tendency to widen its triangular base in the northeastern parts, but early in the 20th century, it grew more in the northeasterly direction. Its recent expansion, toward the north, has given it a trapezoidal form. The city in future is likely to grow in an elongated pattern along the coast.

Mangalore is an unplanned city, with irregular roads and narrow streets. Most of the roads in the commercial zone near the port and in the central parts are narrow and need improvement. Road traffic is heavy in the densely populated southern part of the city. As Mangalore is a centre of road transport in the region, 5 main roads radiate (toward the north, northeast and east), like spokes of a wheel, in the northern part of the city. The total length of roads in the city is 145 km, accounting for 372 hectares or 12.2% of its area.

The residential areas occupy 1,143 hectares or 53% of the city area. The inner zone of the city, close to Gurpur river, presents a dilapidated look; most of its buildings are obsolete, requiring renovation. The structural condition of buildings in southern part of the middle zone is also unsatisfactory. Modern bungalows are found in the northern and eastern parts of the middle zone. Good dwellings also occur in the greater part of the outer zone, except small areas in the north and southeast. Ashoknagar, in this part, is a newly-built area with neat modern bungalows. Houses with mud-walls predominate. In 1961, there were 825 mud-wall and 170 stone-wall houses per thousand households. Majority of the dwellings are covered with tiles; only 40%

houses have thatched roofs. About 65% of the dwellings have one or two rooms and about 11% have 5 rooms or more. Commercial uses account for 21% of the area. The commercial core includes the custom offices, the light house, the marine yards and the ware-houses along the Gurpur. It carries wholesale trade in grains, spare autoparts, engineering goods, coffee, cashew-nuts, tiles, fish and ores. Retail trade is concentrated in Hampankatta, in the heart of the town, and along arterial roads in the inner zone. Other commercial areas occur scattered throughout the city in a linear pattern along the roads. The industrial uses, occupying 3.4% of the area, are found in a narrow strip along the river bank. In this belt are located saw mills, rice and oil mills, government fisheries, cashew, coir, soap, and chemical factories. In 1962-63, the city had 205 factories employing 15,500 workers.

Public and semi-public buildings, scattered all over the city, cover 6.1% of the area. There are 89 educational institutions, including 3 arts and science colleges, 2 professional colleges, a polytechnic and a medical college. Open spaces, including parks and play-grounds, account for 7.6% of the area. Two large and two small patches of agricultural land, occupying 10.4% of the area, occur within the city limits.

The "Greater Mangalore Plan", prepared by the Department of Planning, Government of Mysore, is quite ambitious; it envisages a five-fold increase in the townspread and four-fold increase in the population of the city by 1980. Great expansion in commercial and industrial activities will, however, take place with the development of the deep-sea port at Panambur, for which 340 hectares of land has already been acquired. There are proposals for the development of the plantation and forest industries and fisheries. Provision for heavy industries are made at Suratkal in the north and at Ullal in the south. The light and medium industries are reserved for Keelshekai and Fadaru in the east.⁹

Trivandrum¹⁰, the capital city of Kerala is situated on the Malabar coast at about 220 km from Cochin and 85 km from Kanyakumari. A small stream, Karamana, forms its south-eastern bound-

ary; another stream, Killiar, passes through the city and joins the former at Thiruvallam. The elevation of city varies from the sea level to 76 m. Two low ridges, extending N-S and separated by the Killiar, mark the higher elevations in the north-eastern parts of the city. On the western spur is located the Raj Bhawan, Kowdiar Palace and the Mental Hospital; on the eastern spur are the restricted areas near Thirumala, open areas and residences. The elevation of the Killiar Valley between the spurs and the western part of the city is less than 15 m. The city's atmosphere is hot and humid throughout the year. It has a total rainfall of 180 cm. December-January is the most comfortable period.

Trivandrum is the English corruption of "Tirunanthapuram", meaning the seat of "Tirunantha"—the polyheaded cobra, which supports Sri Padmanabha, the family deity of Venad Kings of the 14th century. It has been the capital of Travancore State since the 18th century and of Kerala since its formation in 1956. Its population in 1901 was 57,882 and area 25.82 km.² The growth of population, during 1901-21 was slow (10-14%) but in 1921-31 it increased by 32%. Trivandrum attained the city rank in 1941 (108,365). Integration of Travancore and Cochin States in 1949 and the formation of Kerala in 1956 encouraged migrations to the city which increased its population, in 1961 to 239,815 and area to 44.52 km.². In 1966, its population was estimated at 340,000 and the corporate area, 77.02 km.². The average density, in 1961, was 40 per hectare; the density of residential areas was 62. A maximum density of 270 per hectare occurred in Valaiyasala ward and a minimum of 17 per hectare in the Beach-ward along the coast. The average density, in 1965, has been estimated at 44 per hectare; this is rather a very low density for urban areas.

Out of a total area of 7,487 hectares in 1966, vacant and undeveloped land (mostly along the sea-beach) accounted for 5.81% and paddy fields, 11%. The area under residential uses (including some cash-crop cultivation) was 65%, under industrial uses 0.6%, commercial uses 1.4%, public places 5.7%, roads and streets 4.9%, parks and

playgrounds 0.8%, and restricted areas 1.6% (Fig. 27.8). The high percentage of residential uses (80% of the total developed area) is due to the scattered and detached nature of the development of the city. About 70% of the residences in the city have two or more rooms. Most of the administrative offices are located in rented buildings outside the core of the city. The main shopping centres are found at Chalai Bazar, Palayam and along the road from Palayam to Manacaud. Other local markets are at Manacaud, Kuriathy, Pangode, Peroorkada and Pettah. Modern shopping centres are lacking in the city.

The industrial area, including a titanium factory, is located in the north-western part of the city close to the coast. In addition, there are factories manufacturing metal products, rubber goods, oil, paper and pottery. In this area is also located the Shankumughom airport.

There are 13 hospitals and 10 dispensaries in different parts of the city. Educational institutions include 6 Arts and Science colleges, one medical college, one engineering college, one ayurvedic college and one training college. Trivandrum is also the seat of Kerala University. The Shankumughom beach, the Public Garden, the water works, parks, the Putharikandam Maidan and three stadia are the important open spaces in the city. The famous Kovalam beach is only 14 km away.

The alignments of roads in Trivandrum is guided by topography. There are three arterial roads diverging from the city centre, one towards Kanyakumari in the south, another towards Quilon and Kottayam in the north, and a third one towards Kundamonkadavli in the east. The roads, in the inner zone, are very narrow.

The Economy

General Land Use : The region has a total area of about 8.9 million hectares of which about 44.4% is under gross cultivation, 6.4% as cultivable waste, 30.4% under forests, 4.6% under tree crops and groves, 1.6% under pastures and 12.6% not available for cultivation. The net sown area accounts for 36 per cent of the total area of the region.

Pressure on land is so great in Kerala lowlands

that the districts of Alleppey, Cannanore, Ernakulam, Kozhikode, Trivandrum and Kanyakumari have more than half of their areas under actual cultivation. The net sown area in Alleppey is 85.7 per cent of its total area; its cropped acreage exceeds its total area by about 6 per cent. In Konkan, the net sown area varies from about one-third of the total area in Thana district to less than one-third in Kolaba and to about a quarter in Ratnagiri. The proportion of fallow land is rather high (15 to 20%) in this part. North

Kanara has only 12 per cent of its area under cultivation.

The proportion of area sown more than once is very high in Kanyakumari (60%) and Trichur (50%). It accounts for one-quarter to two-fifths of the total area in South Kanara, Trivandrum, Quilon and Alleppey.

Demand for agricultural land is so great in the region that only a very small fraction of the total area is devoted to pastures which cover most of the land generally not suited to agriculture. It

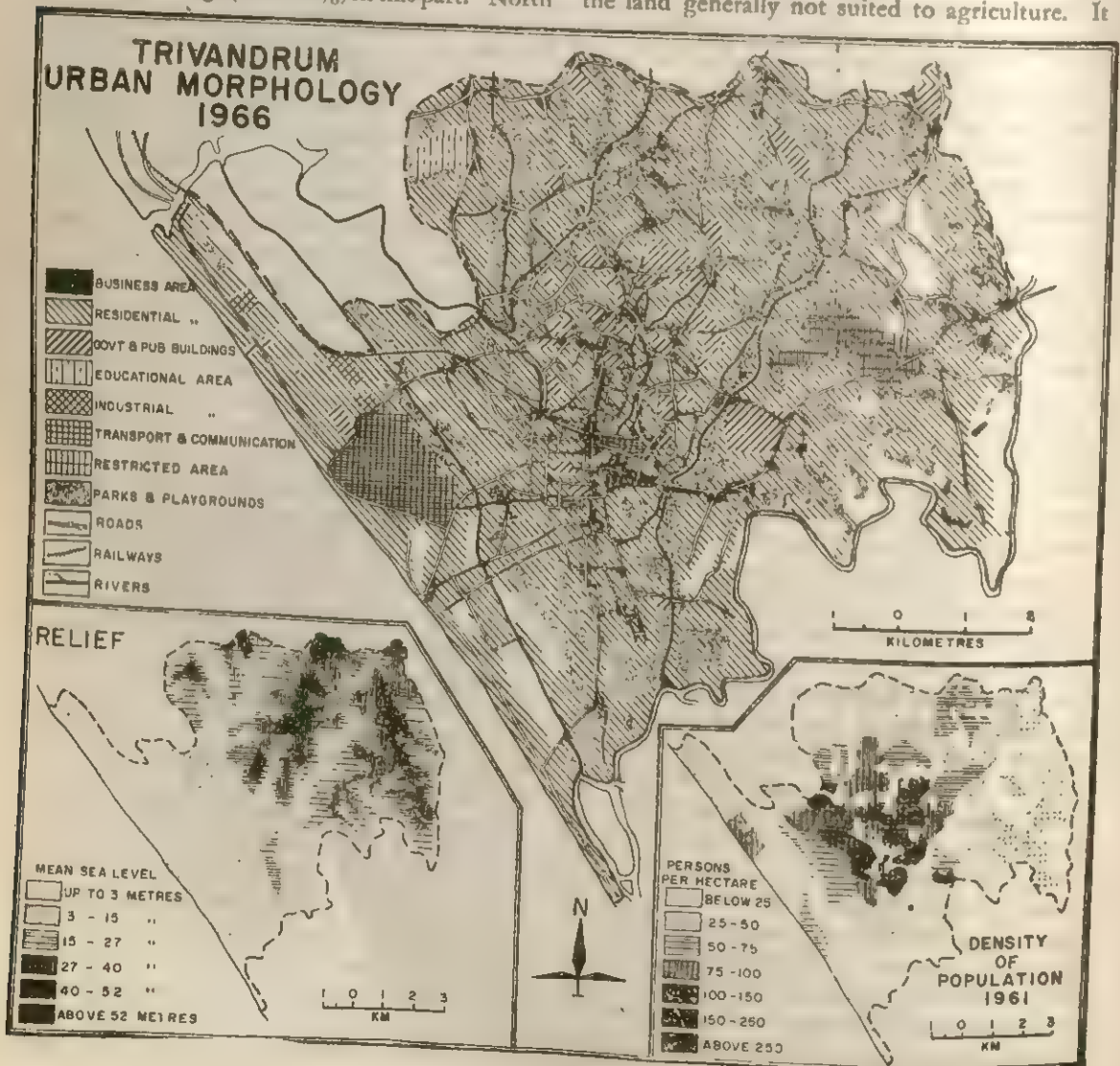


Fig. 27.8

is significant only in Thana (5.6%), South Kanara (4.1), Cannanore (3.0) and Alleppey (2.6). Tree crops, particularly spices and coconut are most important in South Kanara. Kolaba, in Konkan, has 5 per cent of its area under tree crops, mostly mango and cashew. Tree crops, particularly coconuts and arecanuts are also important in Kerala; Kozhikode (9.6%), Palghat (5.6) and Cannanore (5.0) are notable.

Forests occupy large areas in Thana, North Kanara, Kottayam, Kozhikode, Quilon and Trichur where they account for more than one-third to four-fifths of the total area. As much as 80 per cent of North Kanara is forested. The area not available for cultivation is pretty high in Ratnagiri (28%) and also significant in Kolaba (17%), South Kanara (15), Cannanore (11), Palghat (17), Ernakulam (11) and Kanyakumari (19). Ratnagiri also has 18 per cent of its area classed as culturable waste, the highest in the region, followed by South Kanara (9.5), Kozhikode (8.3), Cannanore (7.2) and Kottayam (6).

Agriculture is the mainstay of the people. Both cereal and cash crop farming is carried mainly by manual labour. As the rainfall, though heavy, is erratic, irrigation is required as an insurance against rain failure or for multiple cropping.

The Konkan lowlands are given to the cultivation of paddy in the low-lying valley-bottoms, coconuts along the sandy stretches and cashew, mango and arecanut on the less fertile laterite platforms. Most of the farming depends on the monsoon rains and is carried on in the summer (Kharif) season. Paddy is sown after the first rains in June and harvested in October and November. Pulses and spices are important Rabi crops of Kolaba and Ratnagiri. Garden and fruit crops cover a good amount of land in Thana, in the immediate vicinity of Bombay. Bassein taluk grows betel on a large scale. Dahanu is surrounded by *Chikko* gardens. Coconut, betelnuts and other garden crops are grown under well irrigation in Kolaba. Vegetables are also grown on a large scale in Panvel for supply to the city of Bombay. In Goa, rice is a predominant crop in the coastal lowlands and *nachni*, *vari* and cashew in the uplands.

Agriculture in Karnataka is typically oriented to the production of a main crop of paddy on the fertile loamy soils. Pulse, mostly black gram, is grown as a catch crop after the paddy harvest. Two crops of paddy, or even three in southern areas, are raised with the help of lift irrigation from streams. A few vegetables and spices may be grown in plots enclosed by thorn hedge or mud walls, close to the settlements. Coconut or casuarina crops are very important, especially behind the sea-shore. Most of the higher sandy wastes and dunes have been reclaimed for coconut garden. Inferior paddy is grown on the low lateritic plateaus or hill sides. A small part of the wet land is often used for irrigated chillies and vegetables as *Rabi* crops.

Paddy, again, is the most intensively cultivated field crop of the Kerala lowlands, occupying a prominent place in the agricultural economy. Its yield has been successively increased during recent times with the use of improved seeds, better techniques of cultivation, irrigation and application of fertilizers and manures. Two crops of paddy are obtained where irrigation facilities are available. Transplanting of rice takes place here even under submerged type of cultivation. Tapioca is the most important field crop of the higher parts of the lowland and the midland zone in Kerala. Other important field crops are pulses, sugarcane, ginger, groundnut and sesamum. Ginger is primarily an export crop and sugarcane an important cash crop of the area. In irrigated areas, pulses are raised as second or third crop after the harvest of paddy. Oilseeds, millets and ragi are the other high-yielding crops of the midland zone. Recently there has been a decline in the acreage of ragi and cotton. Coconut, pepper, arecanut, cardamom, rubber, coffee and tea are the important plantation crops of the area.

Irrigation : The irrigated area is very small both in the Konkan and Karnataka lowlands. Lift irrigation is practised from shallow wells in the coastal alluvium of the Konkan. About 5,000 hectares are under well irrigation in Thana district where garden crops are raised. The area under irrigation in Ratnagiri is about 6,500

hectares or 3.3% of the total sown area. Of this, about 80% is canal-irrigated.

Lift irrigation is also practised on a very limited scale on the Karnataka coast. Lifting of water is usually done by *vatta* from behind temporarily constructed dams across small streams or from a well in the lower field. The total irrigated area in Kerala coastland is 1.15 lakh hectares (1961). Of this, canals account for 50%, tanks about 9%, wells only 4%, and other sources—hill streams, small diversion works and water pumped from rivers, about 37%. Paddy accounts for two-thirds of the irrigated acreage.

Attempts to tap the very rich irrigation resources of the Kerala lowlands have been successively made in the last two decades. The Kodayar Extension Scheme—the first irrigation project in Kerala, was completed in 1947. Two more irrigation projects, the Peechi and Chalakudy I, were completed by 1951. The Vazhani and Neyyar I irrigation projects were added during the First Plan period. Six more projects were completed by 1961. The total irrigated area, in 1956-57, was about 30% of the net-sown area under field crops.¹¹ A large proportion of the irrigation facilities is given to the stabilization of one or two crops. In 1961, about 66% of the irrigated acreage was double-cropped, only 28 per cent single cropped and 6% given to drainage, flood control, dewatering, etc.

Cropping Pattern : Food crops account for about 60% of the total cropped acreage. Other than paddy, ragi, tapioca, sweet potato, pulses and sesamum are important. The total area under paddy is about 14.90 lakh hectares (41% of the cropped acreage). Fruit crops are very important throughout Kerala and in Kanyakumari, South Kanara and Ratnagiri districts, and together with garden crops like ginger, chillies and turmeric, account for 7 percent of the cropped area. About 18% of the cropped area is under plantation crops mostly in Malabar and Kanara; about 13.8% is under coconuts alone. Fodder crops are mostly grown in Konkan and North Kanara. It has a total area of 2.69 lakh hectares (7.3% of the total cropped acreage).

Agricultural regions are generally crop-combina-

tion regions based on the areal differentiation of the crop-structure and the agricultural efficiency of the areal unit. Preponderance of rice cultivation is marked throughout the west coast. Its association with other crops, however, varies from North to South. Thus, there are about 14 crop-combination regions—2 in Konkan, 2 in Kanara and 10 in Malabar or Kerala (Fig. 27.3). The large number of regions in Kerala is due to its diversified cropping pattern. Its agricultural efficiency is much higher than that of even the Middle Ganga Plain. The following agricultural regions have been identified : 1. North Konkan lowland (RFMGc) with rice-fodder-millet-garden crops; 2. South Konkan lowlands (RFMPu) with rice-fodder-millet-pulses; 3. North Kanara (RFMC) with rice-fodder-millet-coconut; 4. South Kanara (RCPuB) with rice-coconut-pulses-betelnuts; 5. Cannanore (RCPB) with rice-coconut-pepper-betelnuts; 6. Kozhikode (RCTB) with rice-coconut-tapioca-betelnut; 7. Palghat (RCBP) with rice-coconut-betelnut-pepper; 8. Trichur (RCPuT) with rice-coconut-pulses-tapioca; 9. Ernakulam (RCTP) with rice-coconut-tapioca-pepper; 10. Kottayam lowlands (CRTP) with coconut-rice-tapioca-pepper; 11. Alleppey (RCTSe) with rice-coconut-tapioca-sesamum; 12. Quilon lowlands (TCRPu) with tapioca-coconut-rice-pulses; 13. Trivandrum (TRCP) with tapioca-coconut-rice-pepper; and 14. Kanyakumari (RTCPu) with rice-tapioca-coconut-pulses.

Industrial Economy

The industries of the region are mostly concentrated in two distinct areas : (i) in and around Bombay and (ii) the Kerala lowlands. Very few industrial locations are met in the inhospitable terrains of Ratnagiri and Kanara coasts (with the exception of Mangalore). Large-scale factory production is typical of the industries in Bombay region. The Kerala lowlands, in contrast, mostly have small-scale cottage type industries; industrial locations are more dispersed and the industries more varied here than in the former region (Fig. 27.9).

Greater Bombay, with about 3,500 factories em-

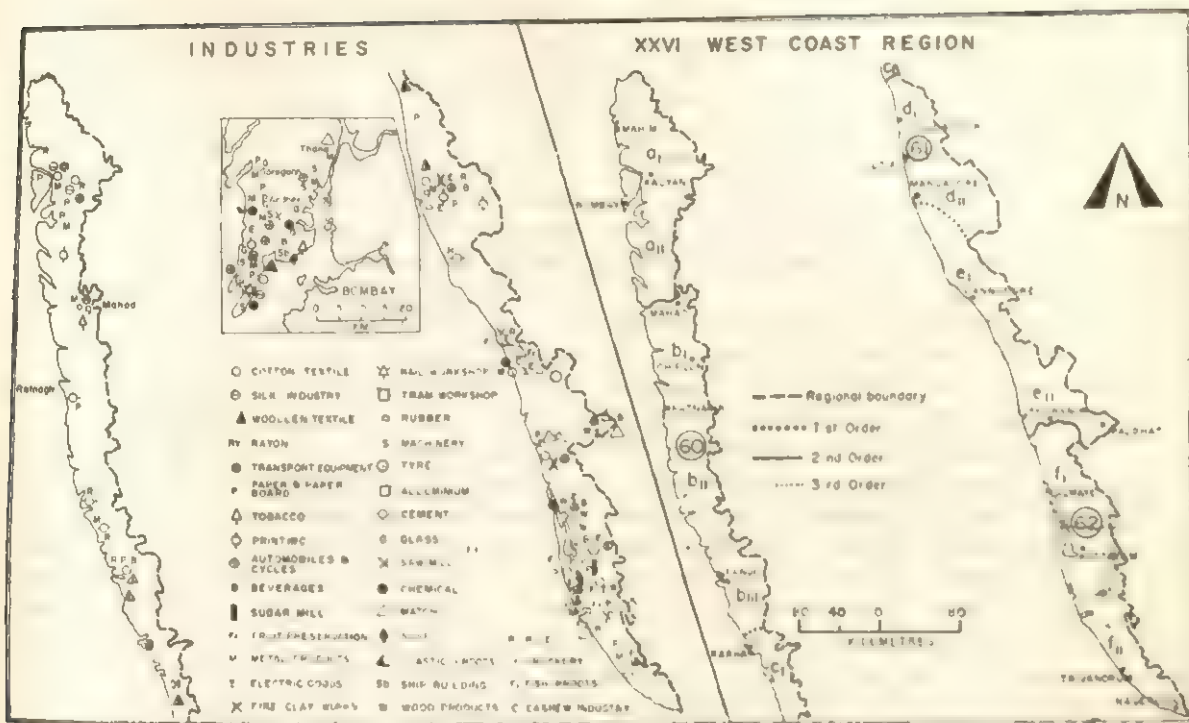


Fig. 27.9

ploying nearly a million workers, is an industrial giant. It receives power for its industries from Chola Thermal Power Station near Kalyan, the Trombay Thermal Station, the Tarapore Atomic Power Station and the Hydel power stations at Khopoli, Bhivpuri, Bhira and Koyna in the Ghats. The chief industries of the Bombay region are textiles, chemicals, general engineering, art silk etc. Bombay is the principal centre of the textile industry in India. It has 66 cotton mills with about 32 lakh spindles and 64,000 looms. There are 9 woollen mills with about 55,000 spindles and 426 looms in Bombay-Thana region. The total number of big and small textile factories, including silk, rayon and hosiery, is about 330 in Greater Bombay. In addition, there are over 800 engineering establishments, 190 factories processing food, drinks and tobacco, 216 concerns producing chemicals, 50 processing skin and hides, and about 800 of a miscellaneous nature. The engineering establishments in Bombay manufacture machine tools including lathes,

drills, hammers and metal-cutting saws, steel castings, moulds, wire nets, welding electrodes, link-chains, steel furniture, safes and ball bearings. Out in the suburbs are industries manufacturing heavy electrical goods like electric motors, transformers, transmitters, cables etc., agricultural and textile machinery, besides heavy chemicals, pharmaceuticals, ceramics, paints and varnishes, and rubber goods. In the last 25 years, an industrial complex has grown up around Kalyan. There are two viscose factories at Kalyan, an ordnance factory and the Wimco match factory at Ambarnath and a metal refining establishment at Vikhroli. Automobile parts are manufactured in Kurla-Ghatkopar area. Recently, two refineries, a rare-earth factory, a fertilizer plant and a carbide factory have come up at Trombay. The concentration of industries in Greater Bombay region is largely due to the existence of port facilities, financial institutions, highly skilled managerial personnel and channels of trade and commerce at Bombay.

There are only a few minor industries like rice milling, salt making, fishing, boat building and *bidi* making in the rest of Konkan. Small-scale paper, paper-board and food processing industries are located at Ratnagiri. Uran has a caustic soda and soda ash plant and Bhiwandi a factory for assembling agricultural implements. There is scope for the establishment of a rice-bran oil plant at Panvel and an aluminium plant in Ratnagiri district.

Fishing is important throughout the Konkan coast. Alibag is known for its sea fisheries. Over 60% of the fish caught is dried or salted. Bombay provides a good market for fresh fish. Salt making pans are located at Bassein and Rai in the north, at Uran, Shewa, Karanja and Pen in Kolaba, and at Shirole in Ratnagiri district. Bassein has 29 salt works employing over 35,000 workers. The annual production of salt at Bassein and Rai is about 61,000 metric tonnes each.

Goa is known for its iron and manganese mines. Besides mining, it has paper and paper-board, leather, fruit processing and alcohol distillation plants.

There are few industries, besides fishing and boat-building, in North Kanara. Fishing settlements are strung here all along the coast from Karwar to Bhatkal. A few saw mills are located at Kumta.

Mangalore in South Kanara is important for its cashew and coffee processing, automobile workshop, metal works, textile establishments, soap and chemical factories, rice and oil mills, tobacco and *bidi* works and tile factories. It also has a paper mill and factories producing electrical goods and transport equipments. At Udupi and Karkal are located small textile establishments, rice and oil mills, and tobacco works. There are, in all, 45 tile works employing 6,000 workers in South Kanara. Tile making was introduced in the area by Basal Mission which established the first tile factory at Mangalore in 1865. It still runs 2 of the 3 largest tile-making factories in the area. Tiles are exported to Ceylon, East Africa, Iran and Malayasia. Small-scale industries employ 3% of the population in South Kanara.

The Kerala lowlands have a varied complex of

industries, mostly agro-based and of cottage type. Cashew processing, employing 95,000 workers, is most important among food industries. It is concentrated in Quilon district which has 153 cashew processing factories out of a total of 185 in Kerala. Fish product industries are located in Kozhikode, Ernakulam and Quilon districts. Shrimps, lobsters and frogs' legs are exported through Cochin. Tea processing, coffee curing and *bidi* making are important around Cannanore. Coir-making establishments are largely concentrated in Alleppey district.

Among the forest-based industries, saw-milling, furniture making, and plywood and paper industries are most important. Saw mills are concentrated in Kozhikode district with 58 saw mills. There are 14 plywood factories, employing 2,750 workers in Kerala. Eight of these factories are located in Cannanore and Kottayam districts, two in Trichur and one each in Kozhikode, Palghat, Erunallulava and Quilon district. Asia's biggest timber yard is located at Kozhikode. There is a paper factory at Punalur in Quilon district. Boat and ship-building industry is located in Ernakulam and Quilon districts where there are, in all, 6 units engaged in the construction and repair of boats, tugs and barges. The best ship-building yard is at Cochin.

The most important among mineral-based industries are the aluminium factories at Alwaye in Ernakulam district and at Kundara in Quilon district. The factory at Alwaye produces aluminium metal and that at Kundara manufactures aluminium conductors, cables and rods. Cement factories are located at Nathakom in Kottayam district and at Chavera in Quilon. Reinforced concrete pipes are manufactured at Chavera. There is a titanium factory at Trivandrum and rare-earth and a fertiliser factory at Alwaye. The fertilizer factory employs about 1,690 workers. Tile and brick factories are located in Trichur and Quilon districts. Manufacture of potteries, china-ware and porcelain-ware is concentrated in Cannanore, Kozhikode, Palghat and Trichur districts. There are ceramic factories at Kundara and Feroke.

A medium-sized rayon factory, employing 150

workers, is located at Ernakulam. Electrical goods are manufactured at Quilon and Kundara, electric motors at Ernakulam and Cannanore, and cycle parts in Ernakulam, Alleppey and Quilon districts.

The industries are widely dispersed in Kerala. A few industrial nodes have, however, developed with distinct specializations. For example, Kozhikode has developed as a centre of coir-processing and forest-based industries like saw-milling, plywood making, chemicals and plastics. Other industrial nodes are Trichur, Ernakulam, Kottayam and Trivandrum. Trichur is important for the manufacture of transport equipment, metal products, cashew industries and beverages, and Ernakulam for coir and coir-products, plastics, cashew, rubber and chemicals. Kottayam is known for cement, transport equipment, coir and coir-products and beverage industries. Quilon and Trivandrum specialize in metal products, rubber goods, oil, paper and pottery.

Transport, Trade and Communication

The region lacks an efficient system of transport. Adequate transport facilities exist, however, in Greater Bombay, Kerala lowlands and the area around Mangalore. In all other areas, the network of transport is thin or very thin and the facilities either inadequate and unreliable or poor or non-existent. Severe bottlenecks and breaks in the system, caused by topography or streams, occur throughout the region. Examples of rail bottlenecks are Thal Ghat and Bhore Ghat near Bombay, Palghat and the less important Shencottah gap in the extreme south. Road breaks occur throughout the region from north to south, more particularly in Ratnagiri and North Konkan districts. The transportation facilities in Greater Bombay region, with its present population and industrial activity, is under severe strain. Electrification of railways and diesel traction have to some extent relieved the pressure on rail traffic. Construction of a pipe-line, connecting the two refineries at Bombay with principal centres of distribution in the interior, will release a considerable part of transport facilities for other uses. Provision of an underground railway and ban on new industries on Bombay Island are other mea-

sures suggested to relieve the traffic congestion in Bombay region.

Railway: There is a total rail length of 1,215 km, 880 km broad-gauge and 335 km metre-gauge, in the Region. Rail accessibility is high in North Konkan. From Bombay, rail lines diverge in three directions, linking it with the principal cities of India. A metre-gauge track connects Marmagao with Hubli on the plateau. Kolaba and Ratnagiri districts in Konkan and N. and S. Kanaras have practically no railroads. Mangalore, at the southern tip of South Kanara, is linked with Madras by a circuitous rail route through northern Kerala and Palghat. A bifurcation from Shoranur connects this section with Cochin in the central part of Kerala lowlands. Farther south, along the coast, is the metre-gauge section between Ernakulam (Cochin) and Trivandrum. Quilon, on this section, is linked with the Tamilnad country through Shencottah gap. Change of gauge at Ernakulam involves serious transshipment problems. Kerala compares favourably with other parts of India in rail density which is about 2 km per 100-km² or 0.5 km per 10,000 persons. The rail density is very high (4.6-6.0 km per 100 km²) in Palghat district. Passenger traffic booking is high at Kozhikode, Quilon, Ernakulam, Alwaye and Trivandrum.

Roads: The transport requirements of southern Konkan and Kanara are met partly by roads and to a small extent by coastal shipping. The average road density in the Konkan, which is 23.5 km per 100 km², is comparatively high, but both the quality of roads and the efficiency of transport are poor. Lack of adequate bridges across numerous rivers, creeks and inlets from the sea, stands in the way of smooth and steady movement of traffic even during the dry months. There is an almost complete cessation of traffic in the rainy season. Nonetheless, a coastal highway connects Bombay with Dahanu in the north and with Pen, Mahad, Khad, Chiplun, Ratnagiri, Sawantwadi and Goa in the south. Cross-roads connect the coastal settlements with the highway.

In Kanara, lorry movement competes with coastal shipping from Mangalore to Karwar. Bus traffic is heavy on Mangalore-Karkal-Udupi

and Karwar-Bhatkal routes along the coast because of lesser number of ferries in these sections. Mangalore is an important centre of road transport and lorry service. There is a heavy movement of goods traffic from the coastal towns to centres across the Ghats on the plateau, as for example, from Mangalore to Shimoga, Bhadravati and Hassan, from Karwar to Belgaum and Hubli, and from Coondapoor to Bhadravati. The road from Karwar to Hubli, developed for the export of ore, is one of the finest across the Ghats. Ore, salt, fish, cotton goods, spices and building materials are the important commodities of transport.

Kerala, in 1966, had 17,252 km of roads, including 3,915 km metalled and 450 km of national highways. The Kerala lowlands have a density of over 45 km per 100 km² which is much higher than the national average. A maximum road density of about 50 km per 100 km² is found in Trivandrum-Ernakulam region. But absence of bridges, weak culverts, narrow width and tortuous alignments reduce the economic usefulness of the roads in Kerala as in other parts of the region. The two vital routes of the region are : (i) Cochin-Coimbatore route through Palghat, and (ii) Ernakulam-Kanyakumari national highway. Goods traffic is heavy on roads in Trivandrum, Kozhikode, Alleppey, Ernakulam and Quilon districts.

Development of an all-weather highway from Bombay to Trivandrum, with transverse feeder routes, is urgently needed in the region.

Inland waterways are of great significance to Kerala lowlands where the west coast canal system extends for a total distance of 560 km between Trivandrum and Hosdurg. A large break, however, occurs in this system for a distance of 47 km between Azhikkal and Badagara. In addition, there are 620 km of cross canals, mostly serving the commercial regions of the midlands in the south, and 840 km of navigable riverways. The Ashtamundi and Vembanad lakes, in the back-water zone, provide excellent navigation facilities between Cochin, Alleppey, Kottayam and Quilon.

Ports and Harbours : Natural harbours are more numerous on the West Coast of India than on the East. Bombay, the principal port of Wes-

tern India, has the finest natural harbour in the country. It handles considerable portion of India foreign trade. Its growth, during recent years, has been phenomenal mainly due to the establishment of two petroleum refineries at Trombay. In 1961, the total weight of cargo handled by Bombay was about 13.1 million tons. Its main exports are cotton and cotton textiler, flour, groundnuts, hemp, hides and skins and sugar, and its imports are iron and steel, kerosene, fuel oil, motor vehicle parts, hardware, cotton, china clay, coal, etc.

There are, besides Bombay, 48 other minor ports in the Konkan. Ratnagiri and Redi, both intermediate-size ports, have been developed during the Third Plan period. More important among the minor ports are Alibag, Shrivardhan, Janjira, Vijayadurg, Malvan, Vengurla and Dabhol. Movement of passenger and goods takes place in coastal vessels and barges between the minor ports and Bombay. Most of these ports, however, lack transshipment sheds, goods handling facilities or even basic passenger amenities. Coasters and country craft regularly carry mangoes, cashew and fish catches to Bombay.

The port of Mormugao in Goa has a fine harbour, but its hinterland is poor. Its export mainly consists of iron ore.

Mangalore is the most important port of Kanara region. It handles about 75% of the coffee trade of India; its other exports are pepper, tea, cashew-nuts and tiles. Tiles account for about 50 per cent of its trade. About 80 per cent of its trade is carried by coastal sailing crafts. Its exports, in 1964-65, amounted to about 55.4 lakh tons and imports only 74 thousand tons. Its inadequate negotiability with the hinterland has adversely affected its development. Ports like Karwar, Kumta, Honavar and Malpe, in Kanara region, have lost their former importance due to development of railways in the interior. They are now mostly collecting centres and entrepôts for the spice-growing villages of the Malnad. Karwar exports Bellary iron ore, moved by road through Hubli. Both Mangalore and Karwar are being developed as deep-water ports for the export of mineral ores.

Cochin in Kerala is one of India's 6 major ports. It handles about 2.4 lakh tons of imports and 3.1 lakh tons of exports of the Malabar region. Tanker berths have been recently constructed to handle the crude petroleum for the refinery at Cochin. A shipyard is also being built here for the construction of bulk carriers and tankers. Other important ports in Kerala are Kozhikode, Alleppey, Trivandrum and Chavra. Foreign and coastal imports mostly take place through the ports of Cochin, Kozhikode and Trivandrum. Cochin and Kozhikode import oil or petroleum, hardware and machinery, fertilizers and food-grains, and export coconut, copra, pepper, ginger, cardamom, cashew kernels, tapioca, tea, coffee, etc. Quilon and Chavra export ilmenite.

Air Transport : Santa Cruz, at Bombay, is one of the three international airports in India. International flights connect it with the important cities of the world and inland air services with almost all the large cities of India. There is also considerable air traffic at Cochin, Trivandrum and Mangalore. These towns are linked by air with Bombay, Bangalore and Madras. Over 1,100 passengers embark and disembark at Cochin and Trivandrum airports every month.

The Regions

The three first order regions of the West Coast are quite distinct from north to south : the Konkan Coast, the Karnataka Coast and the Malabar Coast, corresponding mostly with the respective State boundaries of Maharashtra, Mysore and Kerala; however, Goa is included in the Konkan while the Kanyakumari coast of Tamilnadu is associated with the Malabar coast. On the basis of physical and cultural characteristics the three first order regions have been divided into 6 second order and 11 third order regions (Fig. 27.9).

60. *Konkan Coast*

(a) North Konkan

(i) Mahim Region

(ii) Bombay-Kalyan Region

(b) South Konkan

(i) Mahad Region

(ii) Ratnagiri Region

(iii) Goa

61. *Karnataka Coast*

(c) North Kanara

(d) South Kanara

(i) Udupi Region

(ii) Netravati or Mangalore Region

62. *Malabar Coast*

(e) North Malabar

(i) Cannanore Region

(ii) Palghat-Kozhikode Region

(f) South Malabar

(i) Kottayam-Alwaye Region

(ii) Trivandrum-Nagercoil Region

In the Konkan Coast, the North with metropolitan Bombay and its most natural harbour is rather the most developed region of the West Coast. The coastal lowlands are wider in the North than the Southern counterpart, the widest being near Bombay. The North Konkan is characterised by sandy spits intruding into mud-flats and wider creeks close to the sea and by low coastal ranges separated by longitudinal valleys away from the coast, while the South Konkan presents a rocky and rugged country with lofty hills and elevated plateaux dissected by narrow creeks and streams close to the coast. Moreover, with the Thalghat and Bhorghat gaps in the Sahyadri, the N. Konkan is actively linked with the vast hinterlands which have made Bombay the real Western gateway of India. North Konkan may be divided into two third order regions : the *Mahim Region* in the north and *Bombay-Kalyan Region* in the south. Greater Bombay (41,52,056) is no doubt the largest and most cosmopolitan city of India; its superb position with the large natural harbour has also made it a giant industrial complex. The Mahim Region looks as a tail-like extension of Bombay-Kalyan region; most of the secondary and tertiary activities here are confined along the coast and the railway line, while in the sparsely populated Sahyadri slopes Vada (6,338) is a focal point. The South Konkan has 3 distinct sub-regions, the *Mahad Region* in the north, the *Ratnagiri Region* in the centre and the *Goa region* in the south. Mahad (11,083) on the western flank of the Sahyadri on the Savitri is the regional centre in its region and looks more to Bombay. Ratna-

giri (31,091) on the coast is the regional focus in the central part of the region with road links to Kolhapur on the plateau; it is an important fishing and coastal trade centre. Pulses and spices are as important here as in Kolaba. It is an undeveloped region and food has to be imported. Goa region becomes distinct because of its deltaic conditions in the whole of the West Coast as also its rather prolonged historico-political association with Portugal. Lowlands are prominent for rice while cashewnuts as cash crops are grown extensively on slopes. Panaji (1951; 31,950) is the regional and cultural centre on the coast and has the privilege of being the most important port between Bombay and Cochin. Marmagao (1951; 9,500) is the other important centre. The Karnataka Coast is narrower in the north with lowlands forming small pockets in the lower courses of the streams such as the Kalinadi, the Sharavati etc. and the conical gneissic hills reaching the coast south of Karwar; while in the south its width increases to 70 km at Mangalore in the Netravati valley. Thus, the Karnataka coast is distinguishable into two second order regions: the *North Kanara* and *South Kanara*. South Kanara may be further subdivided into two third order units: the *Udipi Region* and *Mangalore Region*, mainly on the basis of the pattern of economic development. The Udipi region is more agricultural with paddy and pulses (black gram) as main crops, while the Mangalore region has a sizeable proportion of non-agricultural population with coconut plantation and casuarina along the sandy sea-shore and two to three crops of rice on loamy soils based on lift irrigation from rivers. Udipi (24,610) is the regional centre in the former region. Mangalore (170,253) is the most important regional centre and coffee port of India functioning as it does as the sea gateway of Karnataka region; its port functions are likely to be highly boosted up in the near future with improved inland transport linkages. Puttur (17,498) in the inland is a subregional centre.

The Malabar Coast is a distinct physical and cultural entity being somewhat isolated from the rest of the Peninsular India, but with better overseas contact since ancient times. The coast is narrower in the north of Kozhikode and the south

of Trivandrum and wider in the middle (up to 100 km in the Palghat area). The tripartite belted arrangement of the landforms in the form of *Kayals*, alluvial lowlands and the lateite platforms with gneissic foothill is more distinguishable here. Though paddy is the most intensively cultivated crop of the lower part and tapioca of higher parts, the region is a deficit food zone as most of the other lands are devoted to plantation crops like coconut, rubber, coffee, cardamom and tea. There is a greater tendency of lineation of rural settlements, mainly due to the belted arrangement of landforms and the corresponding alignment of transport arteries (Fig. 27.10).

The region may be further sub-divided into two second order regions: *North Malabar* and *South Malabar*, the southern boundary of Palghat district demarcating the two. North Malabar is narrower except in the Palghat gap area and is conspicuous by the absence of *Kayals* which are pronounced in the southern counterpart. In the north rice and coconuts form the first and second ranking crops throughout, the third ranking crop being spices, tapioca or betelnuts in different regions, while in the south coconuts and tapioca take first position displacing rice in Kottayam and Quilon lowlands to second position and in Trivandrum to third position. The South is further distinguishable by the concentration of large and small-size service and industrial centres dotting the coast. It is also in the latter that the proportion of area sown more than once is very high in Kanyakumari (60%) and Trichur (50%). The North being formerly the part of Madras Presidency was rather isolated being away from the main centre of development, while the South roughly coinciding with the princely State of Travancore-Cochin, is better developed though sharing several social and economic problems.

North and South Malabar can be further subdivided into two third order units each, the former into *Cannanore* and *Palghat-Kozhikode* regions and the latter into *Kottayam-Alwaye* and *Trivandrum Nagerecoil* regions. The recently erected Vivekanand Memorial looms large above the horizon at Kanyakumari, the southern tip of India.

SETTLEMENT PATTERNS

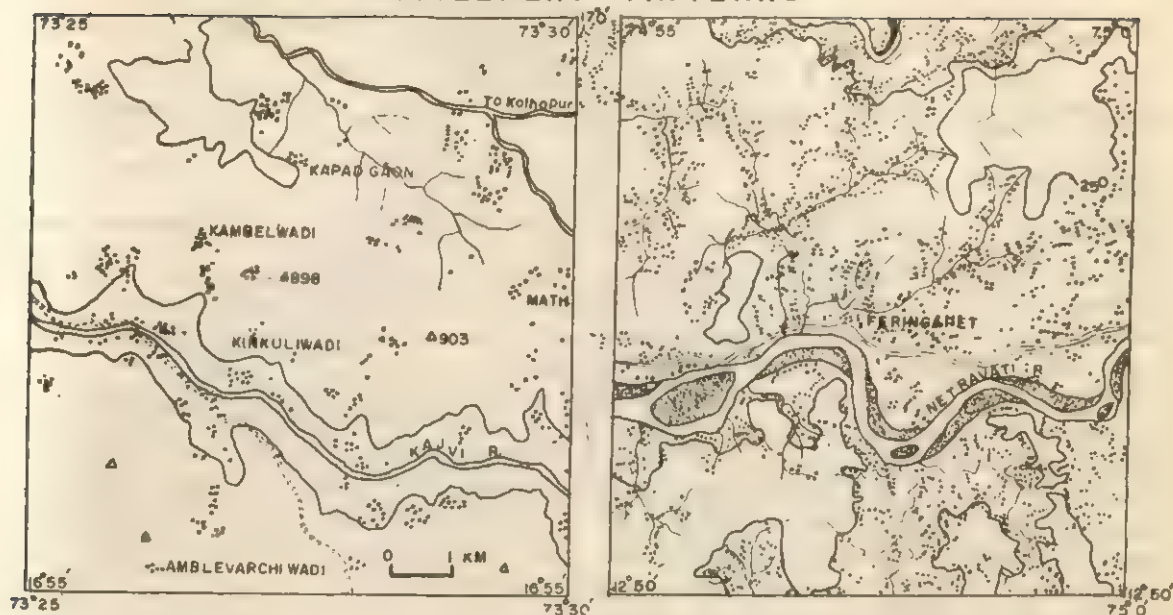


Fig. 27.10

Problems and Prospects

The integration of the West Coast Region is challenged by the difficulty of through-transportation within the region as well as with the hinterland. The coastal shipping services, no doubt, provide limited accessibility mainly through country boats whose activity is almost suspended during the monsoon season. Though the coast has some of the finest natural harbours, the port and anchorage facilities need be improved at several sites, particularly in Kanara and Malabar. The economy of the coast, particularly in respect to organised fisheries (deep sea) with modern equipments, offers good scope for development.

The provision of a West Coast Drive from

Kanyakumari to Bombay and onwards, appears to be a potent solution to improve negotiability amongst its various parts. Moreover, from certain nodes (Mangalore, Karwar, etc.) along the Drive radiating highways towards the interior, particularly in the Karnataka region, deserve priority. With a view to removing subregional disparity, the growth of Bombay metropolis need be controlled through dispersal of industries in future all along the coast. The Malabar coast is confronted with socio-economic problems, particularly in relation to imbalanced production of food and plantation crops. Food deficit in Kerala need be attacked through developing sea-food resources and intensive agriculture.

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The East Coastal Plains ($8^{\circ}-22^{\circ}13'30''\text{N}$ and $77^{\circ}30'30''-87^{\circ}20'\text{E}$) cover about 102,882 km² of area with about 35 million people. The boundary is defined by the State boundary between Bengal and Orissa in the north; towards inland by the discontinuous line of hills forming the Eastern Ghats, more precisely by the contours of 75 m in Orissa, 100 m in Andhra Pradesh (A.P.) and 150 m in Tamilnadu. Politically, the region includes parts of three States—Orissa, Andhra Pradesh and Tamilnadu. The Orissa (Utkal) coastal plain includes small portion of Mayurbhanj, major portion of Balasore and parts of Cuttack, Puri and Ganjam districts; in A.P. the coastal areas of Srikakulam, Vishakhapatnam, E. and W. Godavari, Krishna and Nellore districts while in Tamilnadu the whole of Chingleput and Madras, a small part of N. Arcot, most of S. Arcot (except the hilly tracts of Kallakurichich), the whole of Thanjavur, Tiruchchirappalli (excluding parts of Karur, Kulittalai and Musiri taluks), Madurai, Terunangalam and Melur taluks of Madurai, Ramanathapuram (excluding the hilly tracts of Srivilliputtur taluk), Tirunelveli (excluding the hilly tracts of Nanguneri, Ambasamudram, Tenkasi, Shencottah and Sankarnayinarkovil taluks, and Pondicherry and Karikal areas (Fig. 28.1).

In contrast to the West Coast, these are extensive coastal plains being generally formed by the alluvial fillings of the littoral zone comprising some of the largest deltas. Along with the Ganga delta, these plains have served as active sea-boards not only for the major political units within which they lie, but also for most of the country since ancient times, even though there is naturally restricted development of large harbours. The people of this region have vigorously participated

in coastal as well as overseas trade, particularly with S.E. Asian Realm and have succeeded in putting the stamp of Indian culture on far-off lands.

Historical Background

The East Coastal Plains have been inhabited by man since prehistoric times. Archaeological excavations in the Kortalaiyar basin reveal evidences of human occupation dating back to Abberillian period, and the earliest mention of the Andhra settlement dates back to 2000 B.C.¹ The civilization of the Tamil people was contemporaneous with the Sumerian, Babylonian, Assyrian and Egyptian civilizations. There was flourishing trade with the Mediterranean lands and Babylon. Periplus refers to the Tamil region as *Damirka* (Tamilaham), giving a detailed account of the ports and cities of the region. Arikamedu near Pondicherry was an important Indo-Roman trading centre. Other ancient ports were Karipumpattinam (Puhar), Tondi and Korkai.² Ptolemy names several ports on the eastern coast in "Maisolia"—the region between the deltas of the Godavari and the Krishna, and states that one of them was the starting point of ships bound for "Golden Chryse", the region now comprising Malay peninsula and the Eastern archipelago.³ History reveals that Paradip at the mouth of the Mahanadi was a naval centre and that trade with foreign countries existed since ancient times. The very names of villages near Paradip show that they were important trade centres. Greek, Roman and Arab traders had settled in these ports.⁴

The coastal plain not only encouraged external contacts and trade, but also offered ideal conditions for the growth and development of agriculture. The cores of several ancient kingdoms

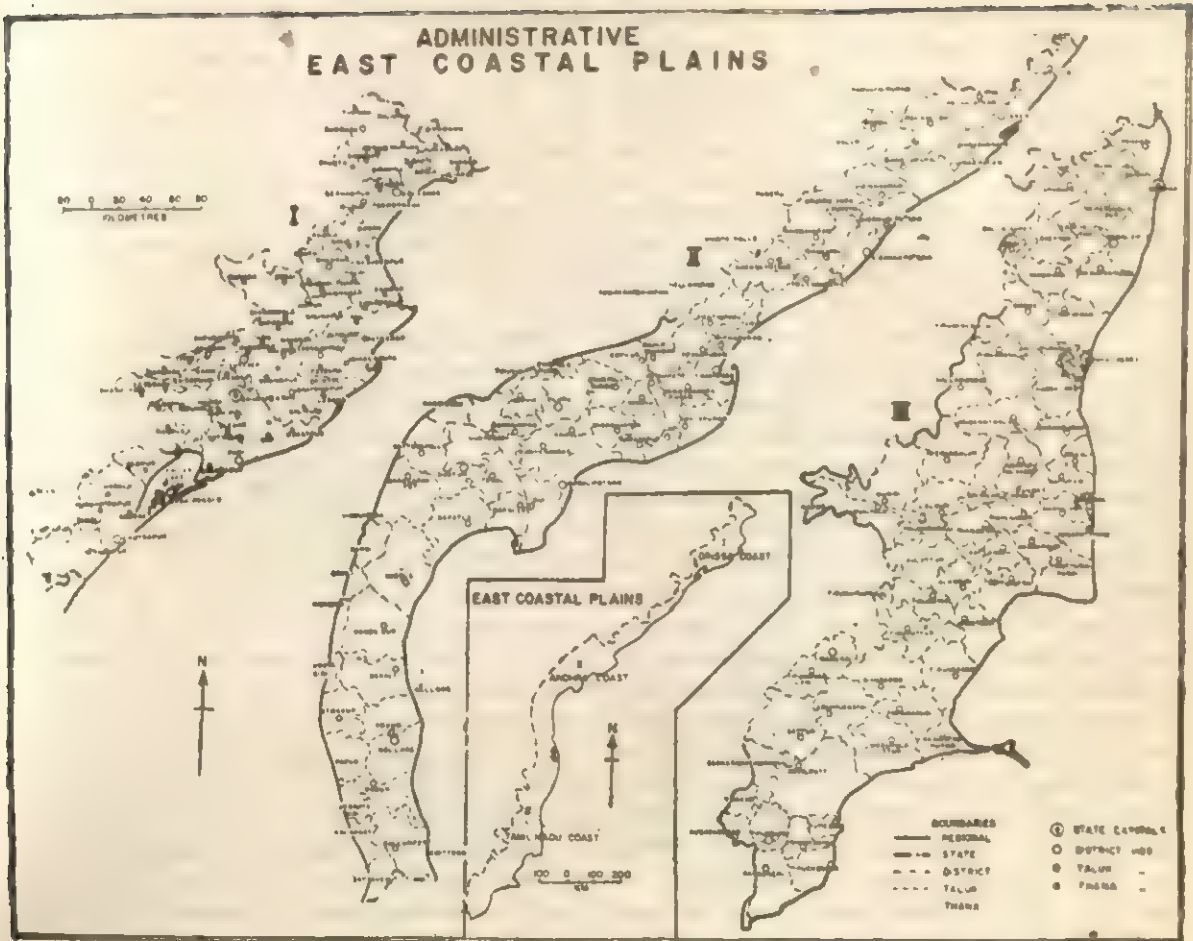


Fig. 28.1

lay in this region. Capital cities like Madurai of Pandyas, Uraiyur of Cholas, Kanchi of Pallavas and Vengi of Salakhkeyanas were located in the coastal lands and drew their strength from the fertile agricultural lands. The region contains most of the important ancient religious centres like the Buddhist *Stupas* at Amravati, Nagarjunakonda, Alluru, Puri, Bhubaneswar, Madurai, etc. The ancient irrigation systems in the Cauvery and other river basins provided the base for large territorial organizations.

The historical period from the beginning of the Christian era onwards witnessed many changes in political administration. Kalinga with the association of Ashoka was greatly influenced by Bud-

dhism. This influence extended up to the Krishna-Godavari delta. Orriya literature and architecture as evidenced from Puri, Bhubaneswar and Konarak temples began to take form.⁵ Telugu script also got independent form as also the Kannada-Telugu script about this time. The Chola kingdom extended from the Pulicat to the Cauvery delta. The southern part formed a part of the Pandya kingdom. The Sangam Tamil literature belongs to this period. The Pallavas of Kanchipuram established themselves in A.D. 4th century and rose to their zenith between the 6th and 9th centuries, holding their supremacy up to the southern districts of Andhra Pradesh. They built remarkable stone temples at Kanchi-

puram, Mahabalipuram, etc. Intricate carvings were a special feature of this period.⁶ The Chola influence spread over the Pallava region towards the end of the 9th century. The Cholas extended their empire rapidly and established external contacts in South East Asia. The Vishakhapatnam port was established at that time. The liberal overseas policy led to the settlements of Muslim traders and it is stated that Abdul Serang used to carry on trade from Vishakhapatnam with the Arabian countries in the medieval period. Later, the Muslim political influence also increased. The establishment of the Vijayanagar empire, however, led to Hindu supremacy which was lost in the latter half of the 16th century and Nayak rulers established themselves. Later on, Marathas ruled over Madurai and Thanjavur till the advent of the British. The Dutch had by then established themselves in Andhra at Bhimilipatnam and planned to develop Vishakhapatnam. The East India Company succeeded to establish itself at Vishakhapatnam and strengthened its military stronghold. The town suffered for a long time because of inaccessibility of its hinterland, till it was opened up in 1933.⁷ The East India Company set up its base also at Nagapattinam and Madras in 1674. The Dutch established their first factory at Pulicat near Madras and the French built their trading centre at Pondicherry in the same year. The 17th and 18th centuries witnessed a number of conflicts among the European powers themselves as also with the local powers. The British, however, were able to hold the control of the region in the beginning of the 19th century. The Madras Presidency extended over a vast area including Malabar, and S. Kanara on the W. Coast and to the borders of Orissa in the east.

The British period is remarkable, among other achievements, for the development of ports, cities, and means of transport—the railways, roads, navigation as well as irrigation canals, which led to the general agricultural, industrial and commercial prosperity of the region. It was during this period that very effective linkage was established between the coastal areas and their plateau hinterlands. The pace of cultural development

was also faster due to spread of modern education and communication media.

With the formation of Andhra State in 1953 and the reorganisation of States on linguistic basis in 1956 has emerged the present administrative set up of this region as parts of three States, Madras (Tamilnadu), Andhra Pradesh and Orissa. The French settlements of Pondicherry and Karikal in the Tamil region were transferred *de facto* in 1954 and the *de jure* transfer was effected in 1962.

Thus the entire East Coastal Plains delimited by a discontinuous line of hills, the Eastern Ghats extending from Orissa in the north to Kanyakumari in the south has varied physical and cultural characteristics. The personality of this diverse region of 3 States is largely explicit in its history which mainly shows its trade relations with other regions. It indirectly brings out the rich and varied hinterland of the region. From ancient times the coastal towns had traded with the Mediterranean traders and the people of S.E. Asia; but still there is general lack of good port development.

The Physical Setting

Geology

The East Coastal Plains predominantly consist of Recent and Tertiary alluvium. Patches of Archaean gneisses and sandstones etc. are also found along the coast.

In the Orissa Plains, a group of limestones, sandstones and clays occur in the beds of Burabalong river south of Baripada town. Similar beds were also encountered several km southward along the river in well borings. Water-worn specimens of a Lamelli branch referable to the genus *Paphia* have been found on the fore-shore at Puri.

Pleistocene alluvium occurs at several places along the coastal tract. Large deposits of laterite occur as capping over Khondalite hills. Such laterite is of *in situ* origin, while the laterite occurring at lower levels is of detrital origin.

The coastal tracts of Balasore, Cuttack and Puri are covered with deltaic sediments of the Mahanadi, Brahmani and other rivers, formed in recent

times. The narrow strip of coastal alluvium in Ganjam also belongs to this age.

In Andhra Pradesh, Tertiary formations are found in East and West Godavari districts and in small areas in Nuzvid taluk of Krishna district. Parts of Rajahmundry and Peddapuram taluks in E. Godavari and Eluru, Tadapalligudam and Kovur in West Godavari contain Tertiary formations of clays useful for the ceramics developed near Rajahmundry.

Laterites occur in Kavelli, Kovur, Gudur and Sullurpet taluks in Nellore district. Some patches of laterites are also found in Vishakhapatnam district.

The Recent deposits occupy the entire coastal plains of A.P. except in portions between Srikakulam in the north and Vishakhapatnam in the south, more in the mainland in Guntur, Krishna, East and West Godavaris.

In the Tamilnadu coastal plains strong earth movements followed by intrusions of basic dykes gave rise to Charnockites in Pallavaram. These rocks contain a high percentage of silica. Several exposures are found in N. and S. Arcot and Chingleput. In Tiruttani the Archaean intrusions were granitic fluids. The close of this era was punctuated by quiescence when schists and gneisses were denuded.

The Archaean era was followed by the Palaeozoic era when limestones and dolomites and thin beds of shales were deposited on the edge of the Dharwarian rocks—Cuddapah system. During the Palaeozoic period numerous dyke intrusions were formed in the Cuddapah system in Tiruchchirappalli, S. Arcot, Tirunelveli and Chingleput. Sandstones of the Gondwana system (Upper) occur at Satyavedu near Chingleput and shales in Sriperumbudur.

The Mesozoic period is marked by marine transgression, submerging Pondicherry and the Cauvery valley during early Cretaceous. In Tiruchchirappalli also excellent examples of Cretaceous formations have been found. Marine regressions started since mid-Tertiary. Eocene formations have been found in Pondicherry and Miocene and Pliocene formations away from coast in Thanjavur and Karaikal. Upper Pliocene and

lower Pleistocene formations are located north of Kanchipuram, consisting of gravels, shingles and grit known as Conjeevaram gravels.

The beginning of the Quaternary Era witnessed the emergence of the present coastline. Several parts of SE Coast of Tamilnadu are covered with aeolian formations, sands and sand dunes, particularly in Ramanathapuram and Tirunelveli. Riverain alluvia cover the deltas.*

Physiography

The eastern littoral is a wide coastal plain comprising the deltas of the Mahanadi, the Godavari, the Krishna, and the Cauvery and the intervening tracts of Tertiary marine sediments, and forms an emergent unindented coast. Between the Subarnarekha in the north and the Kanyakumari in the south, the plains rise gradually from the Bay of Bengal to merge with the irregular alignment of the Eastern Ghats where, roughly, the 150 m contour in the south (Tamilnadu) and 75 m contour in the northern parts separate the region from the Peninsular Uplands. The coastal plains are wider in the deltaic regions and narrow down in between the deltas and thus the region can be grouped into three sub-regions, the Tamilnadu Coastal Plain, the Andhra Coastal Plain and the Utkal Coastal Plain, being coterminus with State boundaries corresponding with the deltas of the Cauvery, the Krishna-Godavari and the Mahanadi respectively. The plains also have well-defined morphological units parallel to the shore-line.

The region has a remarkably straight shoreline with well-defined beaches of sand and shingles. The most famous beach is the Marina Beach in Madras which is expanding southwards since the construction of Madras harbour. The beach ridges on the Utkal Coast indicate the emergence of the coast. In the continuous stretch of this emergent coast there are archaeological evidences of submergence of Royapuram, Mahabali-puram and parts of the Thanjavur coast where the coast of Kaurippumpattinam was buried.

All along the coast there are several sandbars generally athwart the river mouths as shown by the Adyar, the Godavari and the Mahanadi. Another classic example of a long-preserved sand

bar is the Rameswaram Island. Between the mainland and the Gulf of Manaar and the Palk Strait, there are tiny coral islands which form flourishing fishing centres. This chain of coral islands forming fishing reefs is made up of Corothie limestone on a sandstone platform.

Along the strand, the plain of marine and aeolian deposits found up to 10 km inland is a zone of sand dunes. These are found at several places throughout the coastal plain and are caused mainly by the action of wind at low-water tide. In the Orissa Plain, parallel sand dune ridges composed of decomposed granites, zircon etc., brought by ocean currents and winds from southwest, rise 16 to 27 m high and are 1-4 km long. These are supposed to have originated due to coastal uplift. In Puri, the maximum height reached is 9 m in some isolated patches near about Puri, but generally they are 4.5 to 6 m high and extend inland. Each of these hills marks an old sea coast indicating the recession of the sea. Further south, sand dunes rise 10 to 16 m in the Krishna-Godavari delta region. In Tamilnadu sand dunes form a conspicuous feature along the coast of Tirunelveli and are scattered elsewhere as in Mahabalipuram. They rise 30 to 65 m high and are locally called *Theris*. They are composed of quartz, ilmenite and magnetite sands with a typical red colour induced due to diffusion of iron grains. The dunes carry a thin vegetation of Palmyra palms and thorny scrub which bind the soil. Some of these move slowly towards east and south-east. The veneer of sandstone indicates an uplift since Pleistocene.

Adjoining the line of sand dunes all along the coast are found lagoons formed recently in association with coastal uplift. The Chilka lake and Pulicat lake areas are the largest and most important. The Samang and Sur located north and north-east of Puri are sweet water lakes which have come into existence between the 7th and 8th stage of the delta development. The Chilka lake is located in the southwest edge of the Mahanadi delta. It is 65 km long from northeast to southwest and is wider in the northeast and narrowed only to 8 km in the SW. It is the biggest lake in the country and its area varies

between 780 km² and 1,144 km² from the winter to monsoon months. The salinity declines to a minimum during the monsoon but in winter, due to the overflow of the tidal water through the narrow opening from the Bay of Bengal, it is minimum. The lake is shallow in the NE due to heavy silting by detrital matter brought by the Deys and the Bhargavi. It is deep in the SW where the spurs of the Eastern Ghats enter the lake. Further south, on the border of Andhra and Tamilnadu coastal plains, is the Pulicat, a backwater lake. It is cut off from the Bay by a long spit of sand and mud. The tides have free entrance and the water though constantly changing is brackish. Salinity is less in November and greater in summer. This lake, 80 km long NS and 3-18 km across, comprises several small islands within it. Further south along the coast are other small backwater lakes like Ennore and Mahabalipuram which are mostly silted up. The backwaters of the sea have also given rise to Marakkar, Veakaranyam, the Mangreni Swamp in Orissa and a few others in the Krishna-Godavari delta. Thus, in general, three types of shorelines have developed along the East Coastal Plains—the rocky shorelines appear between the deltas, the prominent stretches being in Ganjam and Vishakhapatnam transverse to the grain of the Ghat ranges; upon the Tertiary gravels have developed the sandy shorelines, while the alluvial and silty deltaic shorelines are found at the mouths of the Mahanadi, the Godavari, the Krishna and the Cauvery.

The coast forms a monotonous plain rising gently westwards to the foot of the Eastern Ghats with wide variations in width. The plains are marked by the deltas and lower courses of mature rivers forming broad shallow valleys. The monotony of the topography is broken by the presence of numerous hills, being more conspicuous in Tamilnadu, especially between the Adyar and Palar rivers. These hills show not only accordant levels but also appear to be strikingly similar in shape with almost pointed summits and rise steeply from an otherwise flat plain. The hills have a distinct NNE to SSW trend forming 3 ridges tending to converge towards the SW where the

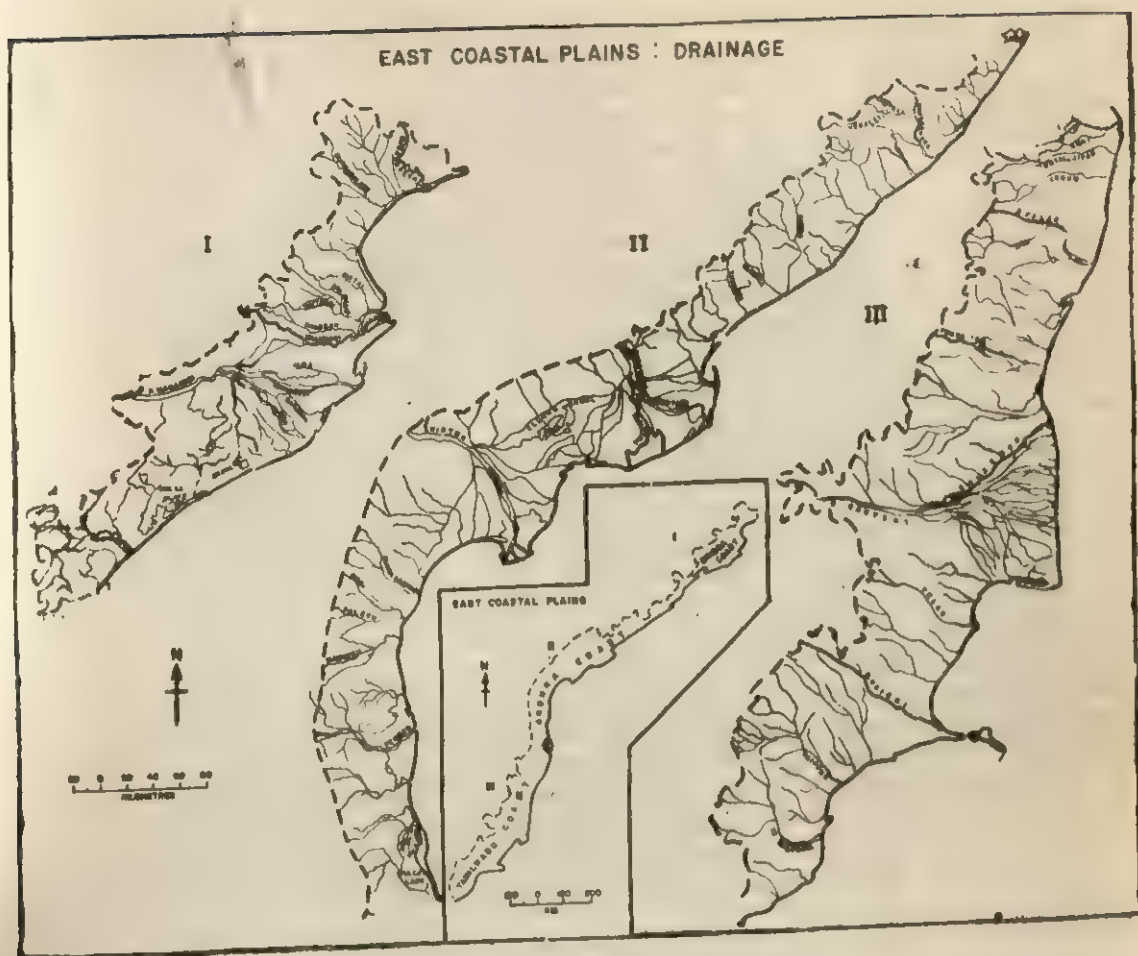


Fig. 28.2

highest peak is found in Ketchimalai (240 m). Though similar rocks occur to the south and west of the Palar, these hillocks do not show linear arrangement. They are considered to be inselbergs left standing on a flat plain as a result of differential erosion over a low peneplain.⁹ The hillocks in the Mahanadi deltaic region are considered to be outer flanks of the Eastern Ghats. The spurs have extended from Kharao and Delang as isolated dome-shaped hillocks which suggest volcanic origin. The low hills of Baradihi (280 m), Udayagir (188 m) and Kalasiri (216 m) have deflected the drainage of the Birupa and the Kimiria Mai eastwards.

Drainage

The main rivers of the region rise from the Western Ghats and owing to long denudation through geological times have almost reached the base level with broad and shallow valleys. Being rain-fed, they remain mostly unsuitable for navigation (Fig. 28.2).

The Mahanadi in combination with the Brahmani and Baitarani forms extensive alluvial tract stretching from Lake Chilka in the south to Bhadrak in the north, 172 km long and over 80 km wide. The Mahanadi is one of the most vigorous rivers of India though erratic in its discharge.

Most probably the Mahanadi delta developed in 8 successive stages. There was an isostatic change in the coast line which resulted in the emergence of 3 sets of parallel dunes along the coast which disturbed the old pattern of drainage considerably. A distinctive feature in the growth of the delta is that it has its maximum growth not in the centre but in the northern part. Prior to the formation of the delta, the original shoreline was concave owing to the hard bed rocks in the Eastern Ghats. But this character was very aptly maintained up to the sixth stage of the deltaic growth. It was modified in the subsequent two stages of the delta building due to : (a) the Brahmani joining the Baragenguti and the Birupa (the extreme NE boundary) and (b) the Kharsuan joining the Brahmani further down in the lower reaches. The combined action of the rivers has pushed the delta head to its northernmost limit.

The Mahanadi is subject to heavy flooding, causing immense damage. The combined waters of the Mahanadi, the Brahmani and the Baitarni discharged through a common mouth cause floods to linger on and extensive damage to life and property. The floods of 1896 and 1960 proved very disastrous. 94% of the annual total and 95 per cent of the monsoon rain of the entire catchment basin are to be discharged through the Mahanadi delta. The construction of the Hirakud Dam has reduced the incidence of floods in the Mahanadi. The Rushikulya is a notable stream in Ganjam with no delta formation though the coastal plain is extensive enough.

Godavari is the largest perennial river in Peninsular India. After crossing the Eastern Ghats through picturesque gorge (Papi Hills gorge) it emerges at Polavaram into the coastal plain. The width of the river is over 3 km at Rajahmundry and about 6 km at Dowleshwaram. Below Rajahmundry it splits into the Gautami, Vasishta and Vainataya branches which form the delta. The 3 branches join the sea near Yanam, Narasapur and Razole respectively.

The Krishna is the second important river. It is superimposed across northern end of the Cuddapah ranges where the gradient is 0.7 m per

km. Near the sea the gradient is 0.15 m per km. The river carries silt enough "to cover daily an area of 5 sq. miles to a depth of one foot during high floods."¹⁰ It flows into 2 branches near Paugadda in Krishna district enclosing the island of Diwi, and 16 km downstream splits into 3 branches. The Vamsdhara and Nagawati are other notable streams of the Srikakulam district.

Cauvery is the largest and most important river of Tamilnadu. It splits into two branches west of Tiruchchirappalli. The northern branch is called the Coleroon and the southern branch is the Cauvery; 27 km below the bifurcation point, the streams unite to form between them the island of Srirangam, but thereafter the Coleroon takes a north-easterly direction skirting Thanjavur district along its entire length on the north and enters the sea at Devikottai with its water practically undiminished; while the Cauvery takes a southerly direction splitting into numerous branches and covers the whole delta with a vast net-work of irrigation channels. Some of the branches of the Cauvery find their way into the sea carrying surplus water. Others get lost into the expanse of rice fields. The Cauvery, now reduced to an insignificant channel, debouches into the sea at Kavaripatnam; the main branches of the Cauvery are the Vena, Kedarurtiyar and Asasalai. The Addapar, Uppanan and Korriyar are navigable in the lower reaches.

The Ponnaiyar flowing through Tamilnadu for over 300 km carries a highly variable discharge being dependent on local rains. The only significant tributary is the Pamban which joins it on the left bank in Salem. The Palar along with its tributaries, the Ponnai and the Cheyyar, drains the North Arcot and Chingleput districts. The Vaigai is an important river of Madurai district, and joins the Bay at Attangari east of Ramanathapuram. During most part of the year the river bed is dry in Madurai and Ramanathapuram. The Tambraparani rises in the Western Ghats in the southern slopes of the Agastiyamalai in Tirunelveli district and descends the plains in 5 beautiful falls near Papanasan. The river flows in a south-easterly direction through Ambasamudram, Tirunelveli,

Srivankuntam and Tiruchendur covering a distance of 120 km and empties itself in the Gulf of Manaar near Pannaikayal.

The Vellar is formed by the junction of 2 streams, the Vasistanadi and Swata Nadi. The Kortalaiyar flows from an overflow of the surplus waters of the Kavaipatnam tank in N. Arcot district; eastwards it flows into the backwater of the Ennore, north of Madras. The Arni enters Chingleput district in Tiruvallur taluk and joins the sea at Pulicat. The Coovam is formed by the surplus waters from the Kuvam tank in Kanchipuram taluk. It flows eastwards through Madras and joins the sea at Fort St. George. The Gingee known as Vasistanadi rises in Tindicanam taluk and enters the sea at Pondicherry. The Gadilam rises in Kalakurichi taluk in S. Arcot, 96 km west of Mulattai; a natural channel connects it with the Ponnaiyar and the river flows into the sea near Fort St. David, 2 km to the north of Cuddalore. The Vaippar rises on the eastern slopes of the Western Ghats in Srivilliputtur taluk and flows through Tirunelveli district and empties itself into the Gulf of Manaar near Vaippar village.

Soils

The region abounds in alluvium. Red soils, black soils and laterites are also found as transported soils. Alluvial soils are mostly found in river valleys, deltaic tracts and along the coastal area; their composition and textures vary with the geological nature of the catchment area. These soils are of 2 types—coastal alluvium and riverine alluvium. Coastal alluvium occurs all along the coast from Balasore to Kanyakumari, occupying the littoral tracts varying in width from 10 to 20 km. Riverine alluvium is found in the lower courses of the valleys of most rivers and in the deltaic regions. These soils are exceptionally fertile and highly valuable for agriculture, especially paddy. The degree of fertility decreases gradually according to the distance from the river. The soils are generally rich in lime, poor in nitrogen and phosphoric acids. The alluvial soils of the Tambraparani are black loams, well-suited to irrigation.

Laterites are tropical and sub-tropical soils formed by the decomposition of gneiss. The most important components for lateritic formation are iron, alumina and silicic acid as primary materials for the parent rock. In the Utkal plains laterite is found in the northern portion of Balasore district with a width varying from 50 to 100 km. In the Andhra Plains it occupies parts of the Godavari and Nellore districts. In Tamilnadu, laterites are significant in the red hills region of Ponneri and Tiruvallur taluks (Chingleput) and in the Vallam tableland of Pattukotai taluk (Thanjavur). Laterites are also found in small patches in other parts.

Red soils occupy a large part of Tamilnadu and considerable parts of Srikakulam, Vishakhapatnam, and E. Godavari districts and small areas of Krishna, Guntur and Nellore of A.P. They are derived mainly from Archaean gneisses. The red brown colour is attributed to the diffusion of iron content. The soils are poor in lime and magnesium but rich in iron. According to texture they may be subdivided into clayey, loamy, ferruginous soils (Lower Palar Valley), sandy loamy soils (Chingleput) and sandy loamy ferruginous soils (adjoining coastal alluvial tracts).

Black soils are tropical black clays or *regur* rich in lime, magnesium and aluminium, but poor in phosphorous, nitrogen and organic matter. They are found in depressions or in plains without notable relief and contain a high proportion of fine elements and shrink considerably in the dry season. They originate either from decomposition of basic basalt or certain sedimentary clays or decomposition of calcium and magnesium. Scanty rainfall plays a part in their formation. The black soils in this region are not as thick as in the Deccan Trap. It is less moisture-retentive, but more friable and suited to irrigation. *Regur* has a layer of dark nodules formed by the segregation of calcium carbonate. Its fertility is due to self-ploughing character. Black soils occur in a patch near Chilka lake, parts of West Godavari, Guntur and Krishna districts adjoining coastal alluvium, limited areas in Nellore and in parts of Tirumangalam (Madurai), Sattur and Srivilliputtur (Ramanathapuram) and greater part of Kovilpatti

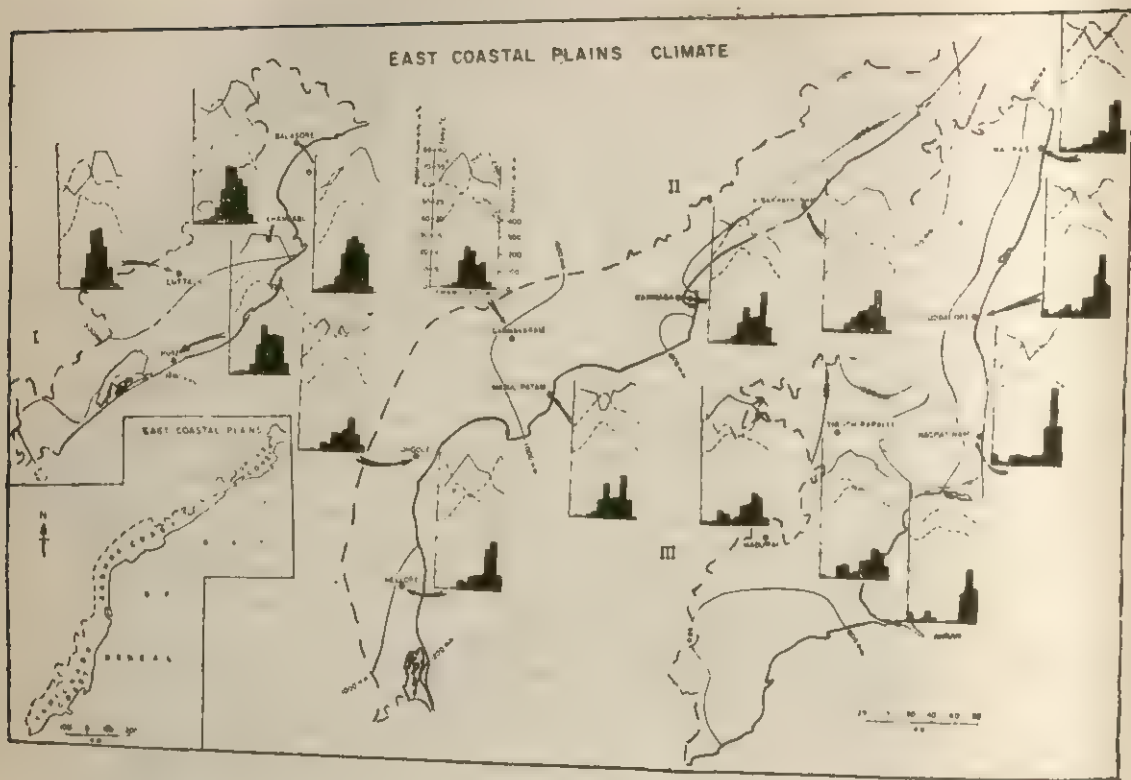


Fig. 28.3

(Tirunelveli) taluks. Cotton is generally grown on these soils.

Climate

The Region exhibits a hot tropical climate characterized by oppressive summer, low daily range of temperature, high humidity and moderate annual rainfall. The coastal tract from Orissa to the Krishna delta experiences a tropical Savanna climate (Aw); from the Krishna delta to the Vaidhar it is a tropical wet and dry climate with distinct dry summer (As). Parts of the southern districts experience a tropical monsoon climate with a short dry winter season (Amw); and the interior districts have a tropical arid steppe climate with winter drought (BSHw). Thus this narrow strip of coast experiences a tropical climate with some local variations (Fig. 28.3).

Temperature continuously increases from the end of February to May, the hottest month

with 31°C at Puri, 35°C at Masulipatam and Madras and over 37° to 40°C in the interior (Gannavaram, Palayamkottai and Cuttack). The coldest month (January) records a temperature of 22°C in the coastal regions and 19° to 20°C in the interior. It is obvious, therefore, that there is little variation in annual normal temperature mainly because of low relief and moderating influence of the sea.

The diurnal range of temperature is lower than in the interior. It is of the order of 2° to 3°C during June to December and 4° to 6°C from January to May.

Rainfall decreases from the shore (140-170 cm) to the interior (70-80 cm). Balasore on the coast gets 168.6 cm, Puri 148.2 cm, Kakinada 117.9 cm, Madras 121.6 cm, Nagapattinam 136.7 cm and Tuticorin 60.2 cm, while in the interior Cuttack gets 144.2 cm, Gannavaram 103.1 cm and Palayamkottai 92.8 cm, showing wide variations in

distribution from north to south as well. Rainfall in Balasore is highest decreasing in amount till it reaches the Krishna-Godavari delta as shown by Kakinada and Gannavaram. Further south it increases up to Nagapattinam (136.7 cm). South of it the rainfall again decreases to 60.2 cm (Tuticorin) and 92.8 cm (Palayamkottai). This variation in rainfall distribution is largely due to the fact that Orissa and northern Andhra Pradesh get rainfall from the SW monsoon (78%). Southward up to the Krishna delta the decrease in rainfall is mainly because the region lies off the main track of the monsoon and the associated depressions. But further south most of the rainfall is caused by the retreating monsoon (44-60%) which is mainly associated with the storms and depressions originating in the Bay giving copious rainfall while striking the coast. The decrease in rainfall further south at Tuticorin (60.2 cm) is due to the barrier-like effect that Ceylon exerts by preventing the rain-bearing winds from reaching this region. One contrast observed in this region is that Palayamkottai in the interior gets more rainfall than Tuticorin. This is because it gets its rainfall from the S. W. monsoon which comes through gaps and river valleys, depicting two maxima for the region. The winter rainfall for the northern region and summer rainfall for the southern region show a similar distribution, giving a distinct transitional rainfall zone between the two regions.

Rainfall Reliability : Moderate rainfall reliability (25-30% coefficient of variability) is found in most parts. The regions of low reliability correspond with areas of high inconsistency of rainfall. The moderately high variability is due to the fact that rainfall is associated with depressions from the Bay of Bengal which themselves are erratic. Areas of somewhat moderately low reliability lie in the coastal plains of Ganjam and Puri. High variability is noticed in the Chidambaram-Karur area of Tamilnadu.

In general, high humidities prevail throughout the year in coastal areas. In Tamilnadu it varies from 60% (June) to 80% (November-December). In Orissa it remains 60% from December to April and over 80% in July-August. In both the re-

gions September records slightly lower humidity further inland, 40-60% in the rainy season and 40% or less in summer.

Winds are of moderate strength throughout the year becoming stronger in the monsoon season (15 km per hour) and weaker in October (5-10 km). From October to January winds blow from north-east and from south-west during the summer monsoon. In the Tamilnadu coast gusty east-south-easterly to south-south-easterly winds of an average speed of 16 km per hour in April set in at mid-day and at a later hour in October at 2 P. M. From November to March the prevailing wind is from northeast and east without showing any change during the day.

Special weather Phenomena : During the post-monsoon and early part of the N. E. monsoon storms and depressions originating in the Bay affect the weather of the region. Some of these depressions intensify into severe storms with strong winds (80-140 km per hour) and squalls giving heavy rainfall to the coastal regions and causing considerable dislocation to communication and loss to property. Some of these storms sometimes cross over to the west coast.

Vegetation

The coastal plains have a very small percentage of the area under forest cover. Most of the flat lowlying area is devoted to agriculture. Natural vegetation is in the form of littoral forests, marshes and swamps, scrub wood lands or discontinuous thorny thickets. Often these scrubs are removed and plantations of casuarina or coconut are introduced.

Tropical Moist Deciduous Forests are found in a haphazard manner throughout Ganjam, Puri and Cuttack. In Andhra Pradesh they are found mainly in Srikakulam, Vishakhapatnam, East and West Godavari districts; these forests dominate in the districts where the rainfall is high. However, these are almost absent in the Tamilnadu Plains.

Scrub-woodlands have a thorny growth (7-10 m) with a clear canopy and open undergrowth and ground cover. Sometimes Acacia is associated with the undergrowth of thorny shrubs

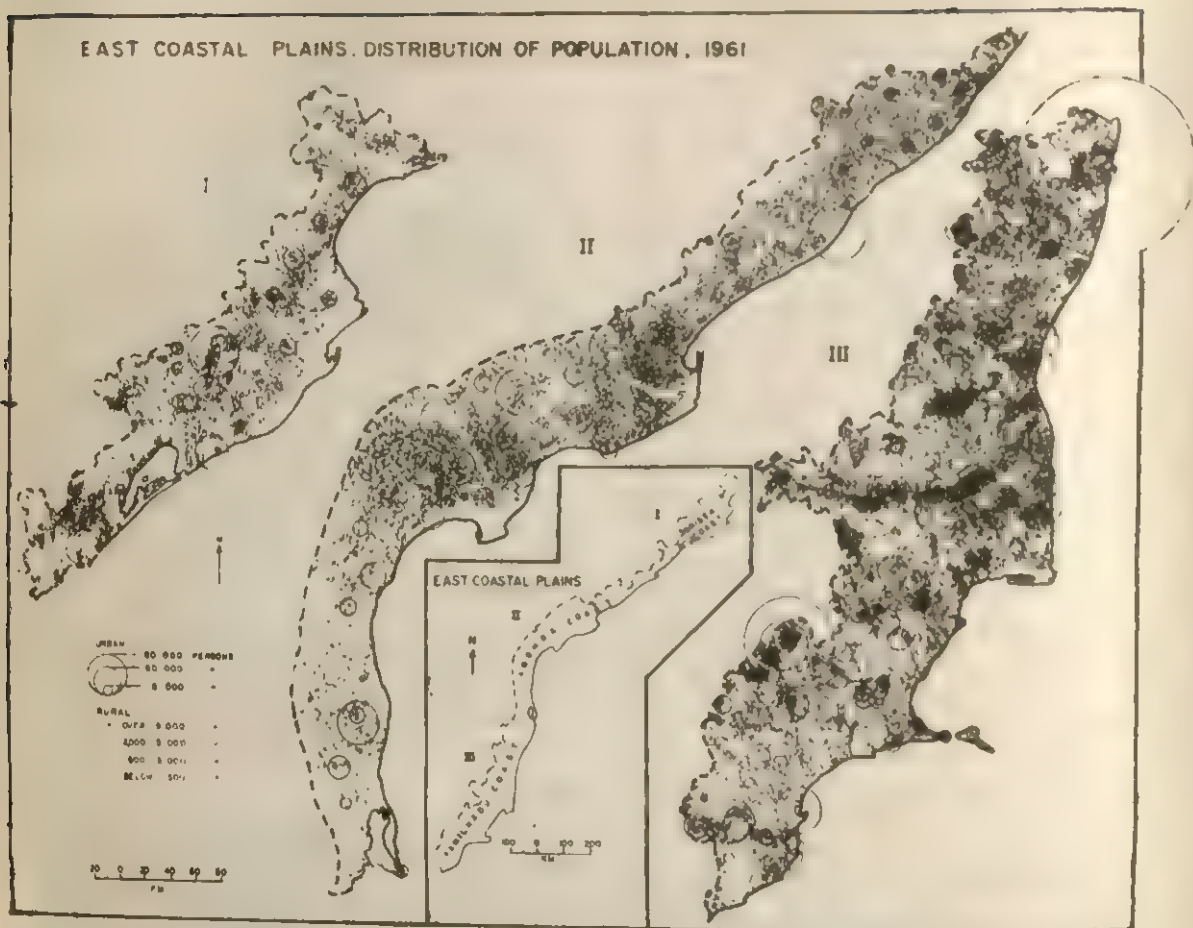


Fig. 28.4

which are negligible in the Utkal Plains. In the Andhra plains it is found most in Nellore district except in Darsi and Podilli taluks, while in Tamilnadu, in Tirunelveli and Ramanathapuram districts. Acacia colonizes the coastal dunes near Pamban and Rameswaram.

Litteral forests occur in a narrow strip along the sea coasts of Cuttack and Balasore districts. In Andhra Pradesh these are found in parts of Krishna, Guntur and Nellore districts. A small coastal area in Kandukar and Kavali taluks is also covered with *Rhizophora* species.

Thorny thickets are found scattered throughout the Tamilnadu coastal plains. These are non-spiny species which grow in the middle of pro-

TECTIVE bushes. Some scattered trees emerge from places to places. Some climbers and grasses are also found.

The Cultural Setting

Population

The East Coastal Plain, the home of 35,185,720 people (1961) has an average density of about 342 persons per km² and accounts for 12.48% of India's population on its 3.2% area. Though the population map shows generally evenly spread high density, local and sub-regional variations in soil fertility, water supply, patterns of land-use and other factors bring out differences in the distribution of population (Fig. 28.4).

There are quite naturally denser concentrations in the deltaic areas of the Mahanadi-Brahmani, Krishna-Godavari and the Cauvery, which are highly fertile and irrigated tracts, as compared to somewhat sparse distribution in the saline tracts all along the coast.

The density of population is higher (257) in the Mahanadi delta than the State average (113). There are 3 tracts of high density—the Balasore P. S., the Middle Coastal Plain with Bhubaneswar-Cuttack-Jajpur area where the density exceeds 401 and the Rushikulya plain. The maximum density (more than 500) occurs in a triangular area of which Berhampur and Chatrapur form the base and Purushottampur the apex. The density ranges between 3,114 in Puri Municipality and 111 persons in Brahamagiri P. S. in the Mahanadi delta.

In the Andhra Plains high density is found in the Vamsadhara-Nagawati valleys in Srikakulam (244) and the Krishna (196) and Godavari (211) deltas.

In the Tamilnadu Plains high density is found in the Lower Palar basin including the region around Madras covering N. Arcot and Chingleput districts, the Lower Ponnaiyar and Vellar basins comprising the coastal tracts of S. Arcot including Pondicherry, the Lower Cauvery basin including the delta in Tiruchchirappalli and Thanjavur districts, and Tambraparani basin in Tirunelveli district. The Region around Madurai city and the foot hill region in Ramanathapuram district have high densities well above the State average.

Low densities prevail in the region north and south of the coastal tracts in Balasore district and around Chilka Lake. In Andhra Plain it is found in E. Godavari and Visakhapatnam plains and in the Nellore coastal plains. In Tamilnadu low densities prevail in the region north of Palar basin, the area between the Palar and Ponnaiyar rivers and that between the Cauvery and Ponnaiyar excluding the tract between Pondicherry and Chidambaram and in the coastal region south of the Cauvery delta—dry tract of Ramanathapuram and Tirunelveli district. The density of population decreases from its coast to the interior except in

Ramanathapuram, Krishna and Godavari districts.

Rural Population : About 80% of the population in the region is rural with an average density of 272. At sub-regional level, rural percentage varies from 91.3 in Orissa to 80 in Andhra Plain. A high rural density (over 300) is found in the coastal tract between Pondicherry and Nagapattinam, comprising the lower Ponnaiyar and Vellar basins and Cauvery delta, mainly because of fertile alluvial soils and irrigational facilities. From coastal strip two tongues of high density (250 to 300) extend along the Cauvery and Ponnaiyar valleys. The area is bordered by steep density gradients on all sides. Another area of density over 300 is in Saidapet taluk surrounding Madras city. A belt of high density occurs along the Lower Palar basin westwards from Madras. In the Tambraparani valley, rural density is lower than in the Palar, Ponnaiyar and Cauvery valleys. A low density (less than 150) area is found in the coastal tract between the Cauvery delta and the Tambraparani valley which is an area of low rainfall and infertile soils.¹¹

The urban population of over 7 million accounts for 20% of the total population of the region. The coastal tract of Tamilnadu (with over 6 million urban population) is the most urbanized region. A network of roads and railway lines and rapid economic development in recent years have favoured the growth of urban centres.

In Orissa Plain there are two urban belts—one containing Cuttack, Bhubaneswar, Chowduar, etc., and the other smaller one consisting of Berhampur, Chatrapur, Gopalpur, etc. Other towns like Balasore, Puri and Chandbali are rather isolated centres.

In the Andhra Plains urban concentration is high around Vishakhapatnam city, and in fact, a zone of urban concentration is formed from Rajahmundry and Kakinada to Vishakhapatnam with 15 to 25% urban to total population in the entire area. This zone spreads out in the rich Godavari delta with several towns along the G.N.T. Road. Nellore-Gudur-Sulurpet zone forms another urban concentration with 18% of the total population as urban, ranging to over 35% in Nellore. Madras district forms the me-

tropolitan area. Other urban concentrations in the Tamilnadu Plain are around Cuddalore and Pondicherry, in the Cauvery valley with its nodes around Tiruchchirappalli, Thanjavur, Kumbakonam and Nagapattinam and Madurai city and its suburban centres. Small towns around Pattukottai and Karaikudi, foot-hill zone of Ramanathapuram district and Tambraparani valley including Tuticorin are other urban areas.

Occupational Structure : According to 1961 census, the percentage of workers to the total population was 28.98 for Orissa, between 45 to 54 for Andhra Pradesh and 45.6 for Tamilnadu. The percentage of workers in the rural areas is naturally higher. In the Andhra Coastal Plains it is between 56 to 58% and about 50 in Tamilnadu. Agriculture engages 50% of the working force in Orissa, 40% in Andhra and 64.49% in the Tamilnadu Plains. The percentage of agricultural workers is more than 80 in the less densely populated tracts of Ramanathapuram, Tirunelveli and S. Arcot districts. The percentage of agricultural workers is less than the average in the highly urbanized tracts also. Mining, quarrying, household industry and manufacturing account for less than 10% of the total working force in Orissa, while Andhra and Madras have more (13.4%). The Tambraparani basin and the areas around Madras and Madurai have double the State average. The importance of manufacturing is quite significant around Madras, Madurai and Tiruchchirappalli and Sattur and Srivilliputtur taluks of Ramanathapuram. Household industry such as handloom weaving is significant in Tambraparani basin, Kumbakonam, Kanchipuram, Arni and Tiruttani taluks. Workers engaged in trade and commerce form only 3% of the total workers in the Utkal plains, about 10 to 12% in the Andhra Plains and 4.9% in the Tamilnadu Coastal Plains, while other services account for 10 to 12%, 25% and 15.4% respectively.

Population Growth : The growth of population during 1901-61 was 70.73% in Orissa, 88.85% in Andhra Pradesh and 75% in Tamilnadu. Most of the coastal plain region has experienced a slower growth than the State as a whole during this period. During 1951-61 the average growth rate

for Orissa is 15.56%, Andhra 15.65% and Tamilnadu 11%. As a whole the share of Utkal coast in the State has shown slight decline during this period. Balasore and Cuttack districts have, however, experienced a high growth rate in the period (20 to 40%). A few *thanas* around Chilka lake namely Krishnaprasad, Brahmagiri etc., too have shown high increase. In Andhra Plain Vishakhapatnam, Masulipatam and Nellore exhibit a higher growth rate (20 to 30%) during this decade, while Madras city and some Suburban taluks of eastern Ramanathapuram alone show a higher growth rate than the State average in Tamilnadu Plains.

Population trends, both short term and long term and urban and rural, show that the coastal plains have been experiencing lower rate of growth than the average for the Indian Union. The areas of high density in the plains seem to have reached almost optimal density under the available resources. There has also not been much town-ward migration as urban growth rates are also lower. Higher than average growth rates have been experienced in areas of low density like Ramanathapuram district. The present trends are likely to continue in the near future as well.

Rural Settlements

The East Coastal Plain is dominantly rural in outlook as 80% of the people live in the countryside. In Orissa Coastal Plain the settlement pattern is generally linear clinging to the roads and river levees, avoiding flood-prone areas. In the shore areas settlements have developed in between the coastal sand ridges which run almost parallel to the shore (Fig. 28.5). They are located in the trough zones for shelter against the high velocity of the cyclones. Such settlements are quite common along Puri and Balasore coasts. As the general level of the land is low, settlements have been established over high levels along the embankments which provide safety from floods. Sometimes these high mounds are artificially raised by piling up earth, dug from the backyards of houses. These are common in the Mahanadi and Subarnarekha-Budhbalanga deltas where almost every house has got a pond (*Pokhari* or *gadia*)

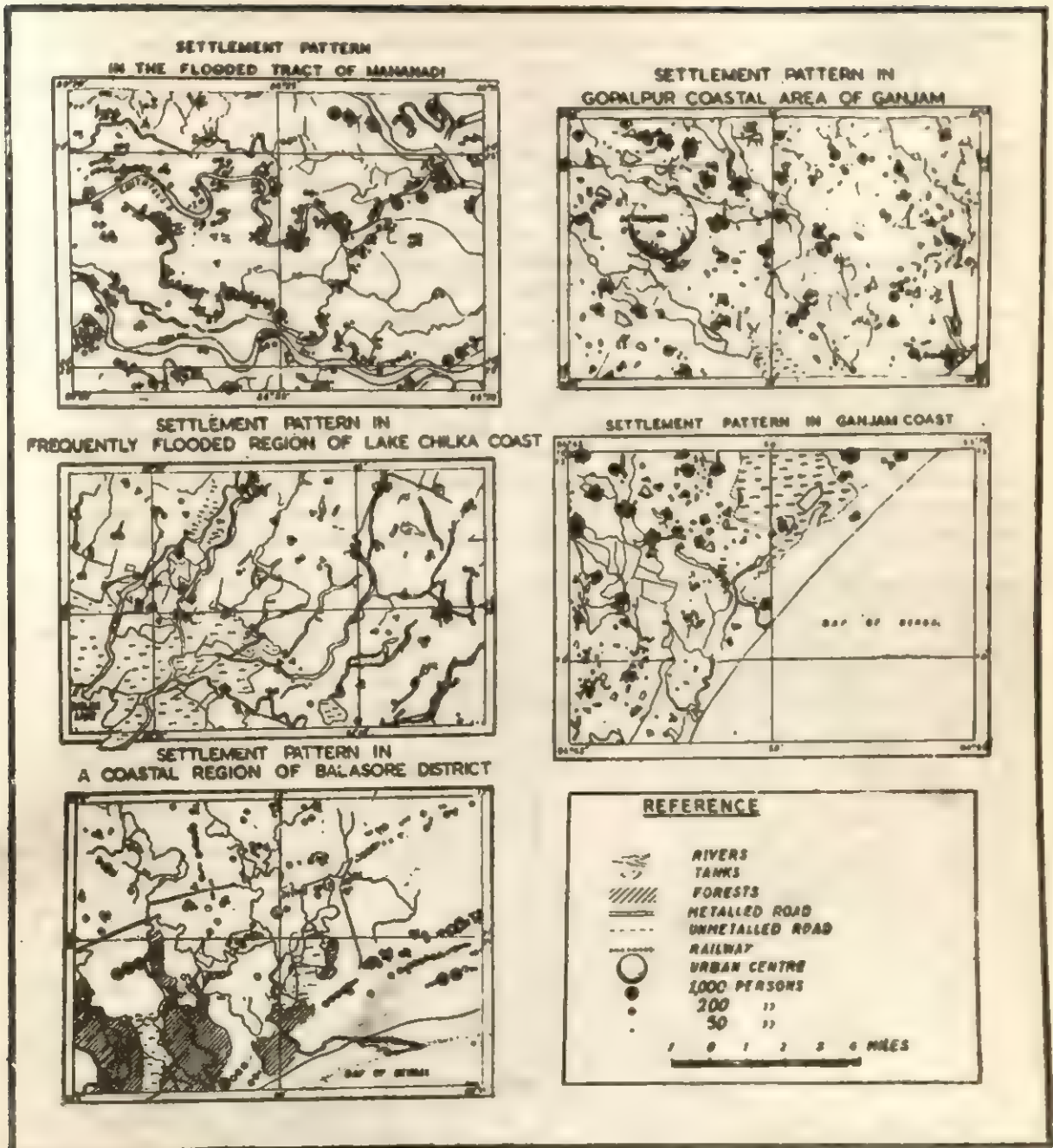


Fig. 28.5

at their backyard, which provide for fishing. In the lake Chilka coast most of the temporary huts are fishermen's settlements. In the irrigated and

flood-protected tracts the density of settlements is high and settlements are of large size, often located along the canals and their distributaries.

In general, habitations are seldom compact. Orchards and betel groves are seen near the settlements. Orasing of Cuttack district is a typical example. Samsunderpur (Cuttack) is a typical compact settlement of the paddy region. The Brahmin villages locally known as *Sasana* are typically linear in the Puri Coast. They are planned villages with straight roads. On either side of the road, temples, facing each other are built, and behind them well-built tanks are located. *Sasanas* are entirely inhabited by Brahmins, being established by Gajapati kings. These Brahmins were brought from Kanyakubja, the modern Kannauj.

The settlements in the Andhra coast and Tamilnadu coast too do not show much difference from the former (Fig. 28.6 A, B, C, D and E). In the Krishna and Godavari delta, there is a tendency to form small nucleations along canals and on high ground or levees to avoid floods. The Narasa-

pur canal has numerous such settlements-Kouttem, Pennugonda, Pekaur, etc. There are linear settlements evenly distributed along the channels, especially close to the coast as also along branch canals and transport lines.

The settlements of the Tamilnadu plains are generally nucleated and compact, located near sources of water supply, such as wells, rivers and tanks. In the Cauvery delta as surface water supplies are abundant and as the region is liable to flood, dry-point settlements are found. There is a tendency for nucleation in the region from Thanjavur to Mannargudi, being associated with large semi-perennial tanks. Beyond the Mannargudi-Kumbakonam line where the pattern of canals is much closer and more rectilinear, settlements are small and scattered. There is the usual lineation tendency along the levees of the drainage line; in the south-east of the delta, there are old beach-ridge settlements and in the old lagoon areas

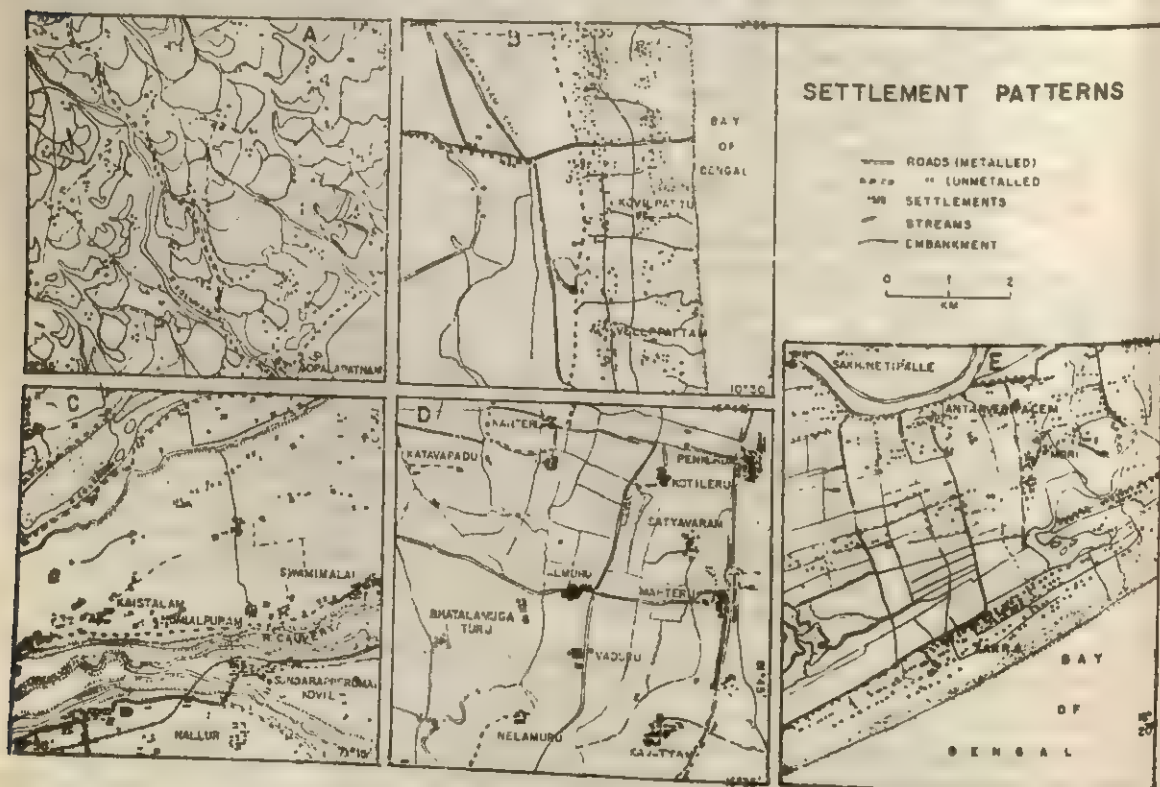


Fig. 28.6

of the Vedaranyam canal and sand dune belt dispersed settlements are found along the sandy littoral strip.

In the drier tract of Madurai-Ramnathapuram, settlements are small and compact, located on the eastern or northeastern sides of the tank, facing the bunds. In this area, a gently sloping land is bunded in the direction of slope even where the shallowest depression occurs. Facing these crescentic tanks settlements are uniformly distributed as small nucleations.

Settlements are large and more closely spaced in river valleys and deltas than in the interfluvial tracts. In these regions settlements are smaller and more widely spaced. In terms of area, villages in the less fertile interfluvial tracts are larger than those in river valleys. In these large-sized villages there may be more than one hamlet around the main settlement.

A typical rural settlement in this region has a rectangular pattern of streets oriented to a temple or tank. The houses are arranged in rows along the streets. There is usually an open space between the house and the street. The space (courtyard) is used for drying grain and other produce and is usually swept and kept clean. Most

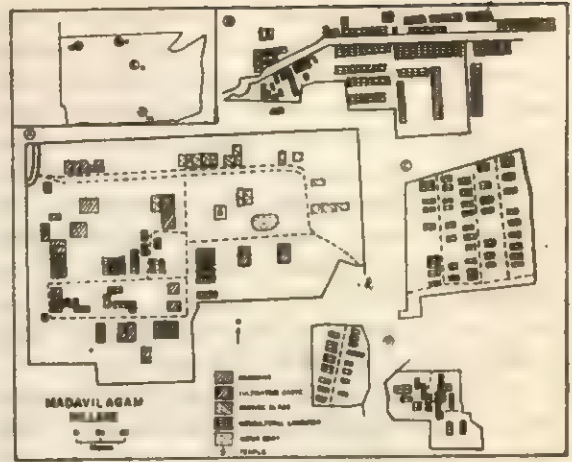


Fig. 28.7

of the houses have thatched and tiled roofs. A few houses may be fenced. The backyard of the house may have a well, sheds for cattle, haystacks and manure pits. Streets are often named after castes, e. g., Chetty street, Brahmin street, etc.

Madavilagam village (868; 1961) is situated 24 km north-east of Tiruvallur on the northern bank of the Kartalaiyar river. It has 5 scattered hamlets, namely Madavilagam settlement, Harijan

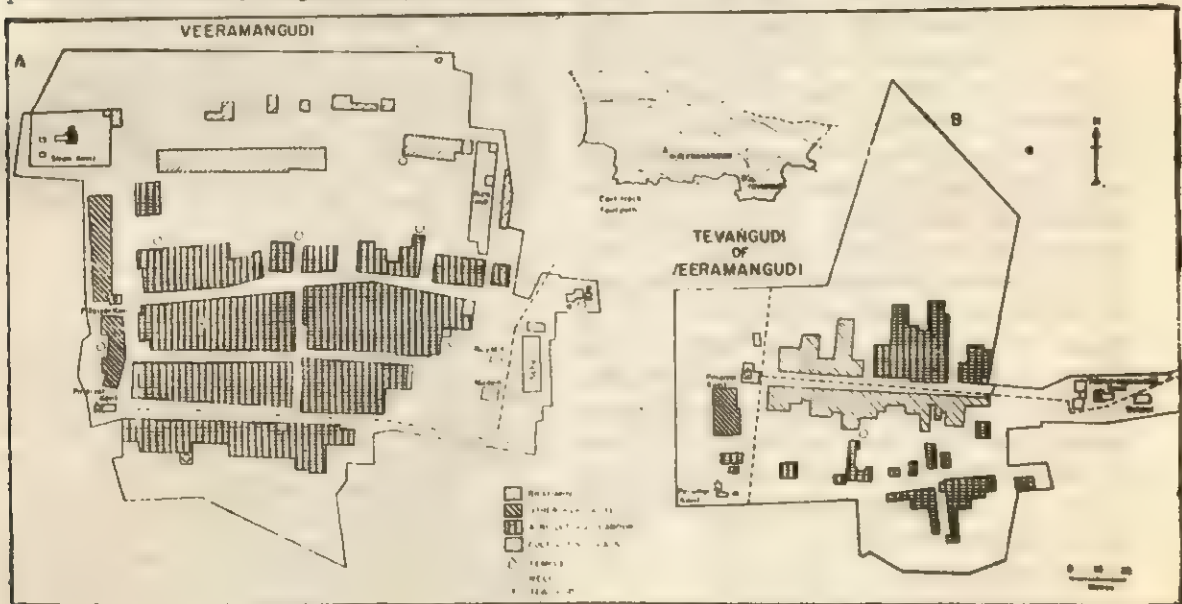


Fig. 28.8

settlement, Madavilagam Thrope Harijan colony, Metupalayam and Metupalayam Harijan colony. Maduvilagam and Metupalayam are the original settlements. Later as the caste system became more rigid, the backward classes were segregated from main colonies which now house Brahmin and service classes. Recently, the housing conditions have been improved by the construction of hutments of bricks and tiles. The poorer classes, however, live in thatched huts built of bricks or clay and bamboo. The big tiled houses belong to the middle class (Fig. 28.7).¹²

Veeramangudi village is situated in the Cauvery deltaic region, consisting of two hamlets, Veeramangudi and Thevangudi, connected by an unmetalled road. Veeramangudi is inhabited by Brahmins and other high castes; this village was given as a gift to the Brahmins in the Chola period. The rivers Coleroon and Meniyertu flow through this village. Most of the land is devoted to sugarcane cultivation. The Brahmins live in tiled houses with brick walls, while agricultural labourers live in houses with mud walls and thatched roofs, the thatching material being coconut palms. The low caste people live in separate blocks (Fig. 28.8).

Marandai Padur is situated in the rain-shadow region of the Tambraparani basin on the eastern side of a tank. It lies on the main road between Tirunelveli and Tenkasi. Except for a wet patch near the tank, the land is dry and *manavari* (rain-fed). The village is rectangular in shape. The Harijans live away from the main village in a government-built Harijan colony near the main road. Likewise, the Muslims also live away from the main settlement-Raghumanyapuram. The Parāyas or Pallas also live away from the main settlement in Subramaniyapuram having shifted from the original site. Most of the houses are tiled or thatched. Walls are made of mud, stone or bricks with lime. The scheduled castes live in *cheris* at some distance in small size huts and are mostly landless labourers (Fig. 28.9).

Urban Settlements

The Region has a long and rich tradition of urbanism due to its maritime location and overseas

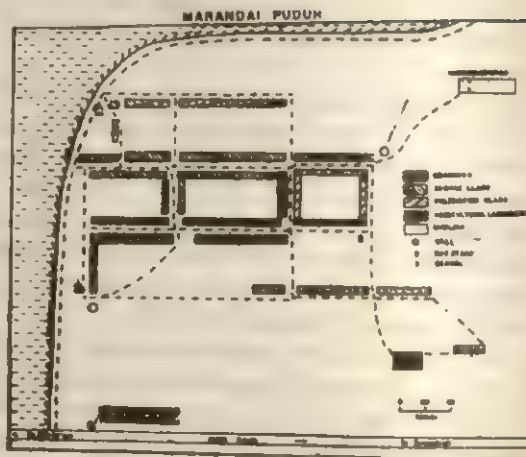


Fig. 28.9

contacts from early times. Most of the great urban centres of the ancient period grew as the seats of kingdoms and as ports and trading centres, but most of them are at present either untraceable or have remained as ruins. Some of the centres like Puri or Rameshwaram are still able to maintain their entity due to religious sanctity attached to them. During medieval period ports and trading centres revived or were newly created by the powers with inland base in order to augment their economy, prestige and power. Many of such centres suffered due to littoral siltation; Masulipatam, Nagapattinam, Kakinada, etc., are some of the examples of such ports. Korkai, Ptolemy's port of Kolkhori, is 7 km inland and Kayal (meaning backwater or lagoon), identified with Marco Polo's Coel, 4.5 km; Arabian and Chinese pottery fragments are traced here.

The present urbanisation started with the European contacts and trading settlements and more vigorously with the advent of the modern means of surface transport with increased traffic from the hinterland. The Orissa coast is the least urbanised and Cuttack, Puri, Balasore, Berhampore, and the newly made capital of Bhubaneswar are the important centres. Cuttack being the old capital of Orissa and having the advantageous location on the delta head, has now several industries with an industrial estate and Chowduar and Barang as industrial suburbs. Bhubaneswar, 32

km south of Cuttack, is the newly planned capital of the State and has good accessibility. Other centres like Balasore, Berhampore (with a new University) etc., are the district, administrative and functional centres.

The Andhra Coast comprising most of the former Northern Circars had a good impetus for urbanisation during early modern period. The territory was ceded to the French in 1753 and 12 years later the EIC was given a grant of the whole by the Moghul emperor. The region saw a rise of a number of small ports and trading centres in the early European phase mainly due to the competition of the European powers. The Dutch established factories at Bimlipatam and Kakinada and the British at Pulicat and later in 1625 at Armagaon, the predecessor of Madras, and the French at French Pettah in Masulipatam, which also had English-Palam and Volanda (Holland)-Palam. Nizampatam was established as the first English station on the East Coast (1611) and a French one at Yanao in the Godavari delta. Vishakhapatnam is the largest urban centre between Calcutta and Madras along the coast.

Tamilnadu Coastal Plain being more expansive with rich and fertile soils and ancient political and mercantile activities enjoys a deeper root of urban life with some of the most ancient cities like Kancheepuram (Conjeevaram, the Kashi of the South), and the modern one, Madras (1,729,141), the fourth largest city of India. This region has been an arena of the political and commercial activities of the European powers, whose relicts may be seen in Armagaon, Pulicat, Fort St. David, Porto Novo, and of them all, Pondicherry (40,421) which still possesses its old charm. Being the largest French possession till recently and its economic prosperity largely depending on smuggling, it is a highly urbanized territory with about one-fourth of its population in the city. The town is closely but regularly built being "largely French or gallicised, an enclave of Mediterranean culture". Cuddalore, Nagapattinam, Karikal, Tuticorin, etc., are minor ports. Among the cities enjoying mid-location between the foot-hills zone and the coast are Thanjavur, Kumbakonam, Tiruchchirappalli and Srirangam (a delta head town), most of them

being trading and regional centres with strong local base. The foot-hill zone is dotted with numerous towns, enjoying the contact-point location and except Madurai (424,810), most of them are small market towns with servicing and industrial base, processing local agricultural produce.

Vishakhapatnam is the 4th largest city (182,004) in A. P. It is unique in having a natural harbour on the East Coast. A great concentration of industrial and business activities has taken place adjacent to the harbour.

It originated in A. D. 1068, most probably when Kulottunga Chola of the Andhra dynasty built a temple dedicated to Lord Vishakha. Nothing much is known of its medieval history and the ancient settlement is probably under the sea. Re-settlement took place only after the 17th century when Europeans settled here; in 1803 it became the district headquarters. The hinterland of the port was limited. The swamps were reclaimed and the topographical barriers were removed for port development and since 1860 the town has undergone a remarkable growth. Along with general urban development, transportation links with the interior and coastal areas were improved and dredging operations augmented the handling capacity of the harbour. The development of the ship-building industry and the later Caltex oil refinery (1955) etc. have stimulated the town growth in a ribbon along the hill range. The open area between the shipyard and oil refinery is reserved for a fertilizer plant (Fig. 28.10).

The main business area forms a ribbon on either side of the Waltair road. Till the first quarter of the present century, the main shopping area was confined between the Shivalayam and Town Hall. With the construction of the Edward market and rapid expansion in the present century new shops have been set on either side of the main road. Today it forms a continuous zone with its extensions beyond Tumer's choultry along the Maharani-peta and Bowdara road.

The residential area forms a horse-shoe shape; prior to the development of the harbour and subsequent expansion of the fringe, it was triangular in shape. In the southern part the residential



Fig. 28.10

area is overcrowded and the northern part is more open. First class residential houses are found in newly developed colonies of Aipuren, Waltair, etc. The port areas include basins and berths with its associated industrial units, transit sheds, etc. There is no defined industrial zone; the industrial ribbon skirting the foot of the Yarda hill range comprises the shipyard, oil storage, and refinery. Gandhigram, Malkapuram and Yarda Park form a residential ribbon skirting the foot hill-range in the port area. Another such ribbon has sprung up at the foot of the Simhachalam hill range comprising the naval residences, port colony and villages. A small pocket has also sprung up to the east of the harbour. The university area in Waltair occupies a remarkable site on the hill overlooking the sea away from the dust and din of the crowded areas.¹⁸

Rajahmundry (130,002), located on the river Godavari at the head of the delta is an historical town, and was once the capital of Chalukya kings during the 10th and 11th centuries. It has developed into an important trading centre exporting the delta produce. The city has assumed industrial importance on account of its paper, tobacco, aluminium, cycle parts and several engineering industries, though no distinct industrial zone has emerged. The large industrial units are located on the northern outskirts of the city, while the aluminium industry is in the middle of the town. The city developed in a ribbon along the Godavari following the railway to Calcutta. The city is known for its education, art and culture.

Kakinada (122,865) owes its importance as the district headquarters of East Godavari. It is also a port town, but in the view of shallow water-

way, the sea-going vessels have to anchor a few km away from the coast. It is a clean and well-planned city. It is an industrial centre where to the south of the Salt Creek are located the brass and ball metal industry, aluminium industry, horn factory, rice mills, etc.

Masulipatam (Bandar; 101,417) is the district headquarters, and is one of the oldest port towns on the East Coast. The *Chintz* and *Kalamkari* products had a world wide fame; but the industry has degenerated owing to modern industrial revolution. The tidal wave of 1854 almost washed away the city. Now it is primarily a residential town with administrative and educational institutions. Some efforts are now being made to revive the Kalamkari cloth printing industry.

Vijayawada (230,397) at the head of the Krishna delta is one of the chief centres exporting rice. The area surrounding the city grows tobacco and vegetables. The city has extended to the east and north-east along the Bandar and Elluru Road. It is an important educational and market centre.

Nellore (106,776) lies along NH 5 on the southern bank of the Penner river. The town in its ancient days is said to have borne the name Simhapuri and Dhenyapuri. Later, as the area came under the domination of the Pandya kings, the place got the name *Neluru*, meaning a paddy village. Nellore serves as a centre for export of rice. Rice milling, tobacco works and motor workshops are the chief industries of the place.

Madurai (424,810), meaning a 'sweet' place in Tamil is the second largest city of Tamilnadu. There is historical evidence that the nucleus (temple) was once surrounded by *Maruda* forest, during the Chera, Chola and Pandya periods, hence a corrupt form 'Maduri or Madurai'. The city originated during the Pandya rule (850 A. D.), built round the temple and tank by king Kadunkone. The Vaigai river flows to the south providing natural defence. Later the temple was remodelled, streets planned and a palace constructed making it the capital of the Pandyas. It flourished till 1310 and later it was desecrated by Malik Kafur. It was revived by Vijayanagar Empire in 1450. The present temple was planned during the Nayak dynasty redesigning the city plan into

a series of squares, marked by Nayak architecture, and it attained maximum growth after 1600. Its growth was again hampered by Muslims from 1736 to 1840. During the British period the city expanded north of the Vaigai with the construction of the Central Jail, Park and Municipal offices and civil lines. It has become a centre of textile industry.

The business area forms the core of the town around the temple and the 4 radiating streets. The recent growth of business area including hotels, restaurants, banks etc., has occurred on the western side of the main temple along the highways near the station and bus stand. A supplementary business area is centred round the fort. Main residential areas are found around the business core. To the west of the railway station, railway and industrial colonies have grown, while the new and somewhat planned residential areas have developed north of the Vaigai (Fig. 28.11).¹⁴

Madras (1,729,141), situated on the Coromondal coast is the capital and principal commercial and port city of Tamilnadu State. The extensive site, 130 km², is a dead level, low-lying flat terrain the highest point being only about 7 m above the sea and is intersected by two small creeks, the Cooum in the centre and Adyar in the south. Nothing of much significance inheres, the site which is regulated all over on the East Coast has had the advantage of choice by the vigorous British and the accidents of history. It is like Calcutta or Bombay also a modern city, dating actually from 1639 when the Hindu Raja of Chandragiri granted the village of Madraspatam to the English.¹⁵ The Fort St. George, erected in 1640 became the nucleus and settlements grew around it; later various smaller towns around were incorporated within the city limits. The 18th century Madras saw many battles; it was blockaded in 1702 by Daud Khan, attacked by the Marathas in 1741, occupied by the French in 1746-48 and twice sacked by Haider Ali, the Sultan of Mysore in 1769 and 1780. Since then there has been a peaceful development.

The city is not highly industrialized for its size; it has cotton textile mills, engineering works including automobile, the Integral Coach Factory

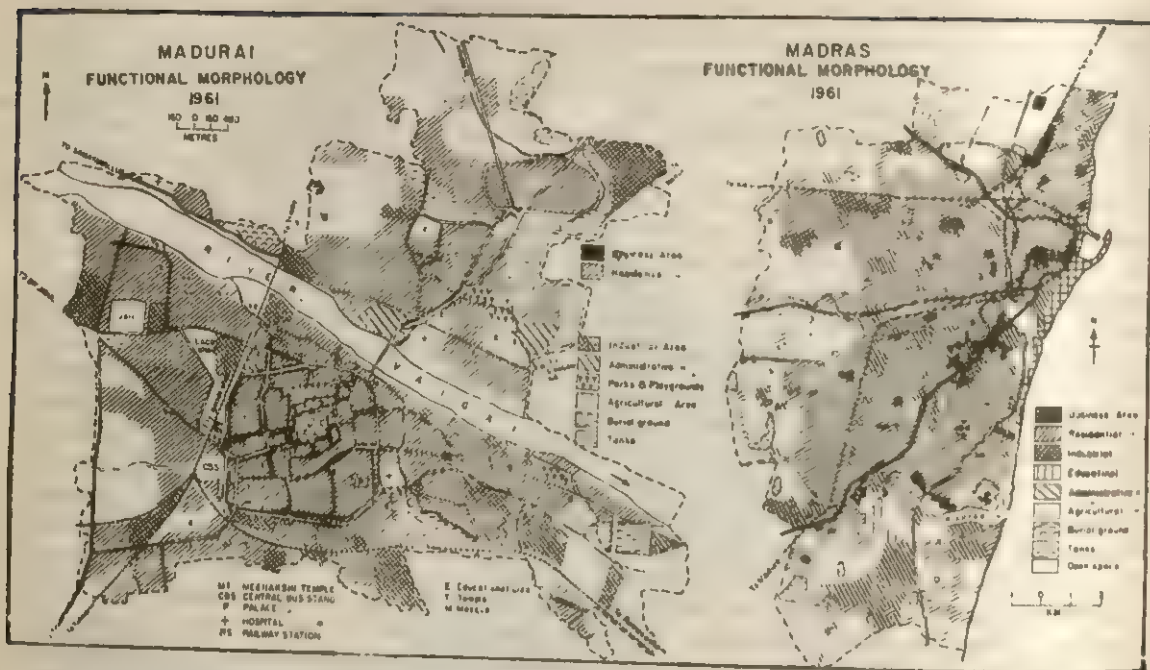


Fig. 28.11

(Perambur), oil refinery (Maneli), tanneries, cement, glass, match and dye works, iron foundries, film industry and food and other metropolitan industries. However, its commercial status is higher and it is a great entrepot of South India. Although the harbour is entirely artificial and expensive to be maintained, it is the third largest in India and accommodates large vessels with its 18 quay berths. The port is equipped with modern ship-handling equipment. Although Madras is not in a superb position of getting raw materials, it is connected with its hinterland by two canals, railroad and trunk road systems. However, the port has suffered, as compared to Bombay or Calcutta, not only because of its artificial harbour but also owing to its rather constricted hinterland. It has also an international airport near Meenam-bakkam.

The city has an amorphous morphology, grown without any structure and planning. It straggles from the Fort, the nucleus, towards north and south and fans more loosely over the extensive flats towards the west. Towards north is the main business district and area of public buildings,

the George town, about 1.5 km square, containing the Custom House, the High Court and banking units. The sea-front is dotted with shipping and commercial establishments and the port installations. The Cooum island contains the parade grounds and clubs, while to the south of the Cooum and the Fort are densely settled areas of Triplicane and Mylapore with ancient Hindu temples. Madras has one of the finest beaches of the world, the Marina, running from the St. Thomas cathedral in the south past Madras University, Government buildings and further north past the Fort to the harbour. In the south along the Trunk Road are newspaper buildings and State legislature complex; in central part of Mount road are shopping parades, hotels and cinemas. Beyond the Cooum in the north-west are the industrial sections including Perambur and extensive railroad yards (Fig. 28.11).

Except in the central portion, Madras enjoys a much lower density than Bombay, Calcutta or Delhi suburbs, and its newer colonies of Ayana-varam, Shenoy Nagar, Gandhi Nagar, etc., are very finely developed. The city may be labelled

a 'green city' with its trees, gardens and parks. Madras is the centre of Tamil culture, art, and literature. Although it is less cosmopolitan than Bombay, Delhi or Calcutta, with its marina, museum, zoo and green open atmosphere, the city is an attractive place to live in.

The Economy

Agriculture has been the most dominant occupation in the coastal plains since ancient times. Owing to the particular sub-regional settings, the three sub-regions differ appreciably in their agricultural characteristics and warrant separate treatment. Though paddy is predominant all through, jute in Utkal, tobacco and oil-seeds in Andhra, and groundnuts and cotton in Tamilnadu create regional distinctiveness in agricultural landscape.

Irrigation: Irrigation has been practised here since ancient times through anicuts and tanks. The Grand Anicut in its original form belonged to the Sangam era of early Chola kings at the junction of the Cauvery and the Coleroon below Srirangam. It was built to prevent the flood water running off waste through the Uilur Channel. The Krishna anicut was built on the Krishna in 1855 near Vijayawada. The three anicuts associated with the Mahanadi, the Naraj, Jobra and Birupa were first commissioned in 1869. The Mettur reservoir built in 1934 was not only beneficial to industrialization but it also helped in irrigation and rural electrification in some areas.

Canals and tanks on the low lands and wells on the uplands form the chief sources of irrigation. The former two sources are linked with river systems, but in places which are not served by rivers, there are numerous small rain-fed tanks. Canal irrigation is more predominant in the delta regions where a continuous supply of water is available. In Chingleput, Ramanathapuram, Tirunelveli and the low land districts of Madurai and Srikakulam tanks become more dominant. This form of irrigation depends largely upon terrain, soils and rainfall.

In the Orissa coastal plain 1.0 million hectares of land are irrigated by five major (out of six in Orissa) and two medium irrigation schemes (62% in Khari).

The canal irrigation schemes can be grouped into the Salandi, the Baitarani, the Mahanadi, the Rushikulya and the Salia systems.

The Salandi Project consists of a high dam constructed at Hadgarh with an ultimate capacity of 558.5 million cu. metre and a barrage at Bidyadharpur. The Salandi canal runs through the foot hill zone of the plain from which a number of distributary canals run NW to SE between the interflaves of the coastal rivers. This canal system with the help of the proposed Anantapur Barrage Project will irrigate 0.49 lakh hectares in Balasore district. *Baitarani System* consists of a barrage being constructed at Anandpur, just beyond the coastal plains. This will irrigate 0.117 lakh hectares in Kharif and 0.08 lakh hectares in Rabi season. In the lower reaches of the Baitarani, an anicut is built at Akhuapada from where H.L.C. Range II and III and Jajpur canals take off, irrigating 0.035 lakh hectares in the Brahmani-Salandi interfluve.

The Mahanadi canal irrigation system, undertaken in 1869, consists of 3 anicuts (i) Naraj at the head of Kathjuri which serves as a feeder anicut diverting the water to the Mahanadi, (ii) Jobra on the Mahanadi and (iii) Birupa which helps in making an artificial lake at the delta head of the Mahanadi. The present irrigation system irrigates (a) the Devi-Mahanadi sector by Taladanda and Machgaon canals, (b) the Mahanadi-Birupa sector by Kendrapara and Patamundaj canals, and (c) the Birupa-Brahmani area by H. L. C. Range 1. This has increased the irrigation capacity from 77,000 in 1946-47 to 118,000 hectares in 1962. Under the proposed extension of irrigation since the completion of the Hirakud dam there will be 8 main canals which will have a capacity of irrigating 430,860 hectares.

In the *Rushikulya System*, started in 1901-1903, two artificial reservoirs have been constructed at Sorada and Bhanjanagar on the Rushikulya and Mahanadi (a tributary of the Rushikulya) respectively. The reservoir water is supplemented by a 9 km long canal from the river Gulleri by the construction of an anicut at Sorisomula. This system irrigates 50,000 hectares, mostly confined to the coastal plain.

The *Hiradberhati Project* is a medium irrigation project with a weir on the Rushikulya, irrigating 5,200 hectares on the eastern bank on the Rushikulya. The *Sulia Irrigation system* irrigates 1,100 hectares in the west of Lake Chilka.

In the non-canal areas some local methods known as *Junta*, *Sena* and *Tenda* are used for lifting water from wells and tanks. The *Junta* is used in lower reaches of the delta where the water table is not very low. In the upper reaches the *Junta* gives way to the *Sena* and *Tenda*.

Andhra Pradesh Coastal area is rich in water resources with the Godavari and Krishna waters. Arthur Cotton brought into existence the mighty anicut at Dowleshwaram (Godavari) the Krishna anicut at Vijayawada and Sangam anicut at Nellore on the Penner. The Godavari anicut system consists of 3 main canals, irrigating 0.33 million hectares, but the gross area irrigated including the second crop is over 0.4 million hectares. In the Krishna delta the anicut at Vijayawada (1852) sends off two canals on either side of the river irrigating about 0.3 million hectares as far as Kolair lake. The Krishna-Elluru canal on the eastern delta connects the Godavari-Elluru canal in the north and Kommanur canal of the western delta joins the Buckingham canal in the south. Thus, canals form a network of irrigation and navigation. The Krishna East bank canal irrigates about 500,000 hectares.

The Penner canal system consists of two anicuts, one at Sangam and the other 32 km below Nellore, irrigating about 68,000 hectares.

Thus 75% of the total irrigated area in coastal Andhra is irrigated by canals. In Vishakhapatnam (57.36%), Srikakulam (71.70) and Nellore (49.67) tanks are quite significant. Well irrigation is not very significant in the coastal plain. A small percentage of the area in Vishakhapatnam, Srikakulam and Nellore is irrigated by wells.

In Tamilnadu, canal irrigation is more predominant in the Cauvery and Tambraparani deltas. In Chingleput, Ramanathapuram, Tirunelveli and the low lands of Madurai districts tanks become more dominant. In the areas where the supply is not continuous water is taken in canals in flood season from anicuts across rivers and stored in

tanks for irrigation purposes. The canal-fed tanks are thus linked to the principal river systems. A series of rain-fed tanks associated with the drainage system have been built one below the other.

A number of anicuts have been built across the Palar and the Cheyyar in Wallajah, Arkonam and Wandiwash taluks (N. Arcot) and Kancheepuram and Sriperumbudur taluks (Chingleput). Other streams like the Ponnaiyar, Vellar, Mannimukta, etc., also have anicuts built across them for irrigation.

The Cauvery delta has the largest irrigation canal system in the Tamilnadu Plain. The Grand Anicut canal (1934) irrigates about 1.2 lakh hectares of land in Mannargudi, and Arantangi taluks (Thanjavur). Further down the Katalai High level scheme, taking off from the head sluice above Katalai bed regulator, benefits 8,249 hectares in Thanjavur and Tiruchchirappalli districts. The Pullambadi canal also irrigates part of the Cauvery basin. The Baipar and Chittar along with the Tambraparani irrigate a considerable area in Srivilliputtur taluk (Ramanathapuram) and Ambasamudram, Tirunelveli, Nanguneri, Tiruchendur and Srivaikuntam taluks¹⁶ (Tirunelveli).

Typically a tank in Tamilnadu Plains consists of an eastern embankment bund blocking the line of stream or closing the outlet of a natural depression in which rain water collects. Tanks irrigate about 902,645 hectares in the coastal plains, with Ramanathapuram having the largest acreage followed by Chingleput, S. and N. Arcot and Tirunelveli districts. In Chingleput district Tiruvallur, Kancheepuram, Chingleput and Madurantakam have 60-90% of the irrigated area under tank irrigation.

Wells are distributed all over Tamilnadu plains, but they are predominantly a feature of the upland, used to supplement the precarious supplies from tanks. Artesian wells abound in south Arcot district, especially in Vriddhachalam taluk and in Pondicherry. These are associated with the Tertiary aquifers of Cuddalore sandstones. Isolated spring belts are found also in Tiruchchirappalli, Thanjavur, Ramanathapuram and Madurai districts. Tube wells (150 m in depth) are used for irrigation in Neyveli (S. Arcot).

Crop Patterns : Cereals account for 77% of the gross cropped area in Utkal Coast, followed by pulses and oil-seeds which together claim about 1/6th. Amongst the cash crops jute, sunhemp, tobacco and sugarcane are important, while rice is dominant cereal making it virtually a mono-culture region. There are three types of paddy-*Sarada* (Kharif) which is best suited for the low lands subject to flooding, *Biali* (Autumn) thrives best in *Sarada* lands which are slightly elevated and free from frequent flooding and *Duala* (Summer Paddy) grows well in marsh lands reclaimed by suitable drainage methods in areas subject to flooding and harvested before the onset of the monsoon. The intensity of rice cultivation shoots upto 90-97% in several parts of the region. It is higher in the non-irrigated tracts of the delta in the Devi Daya sector, whereas it declines to 60-65% in Mahanga, Salipur, Patkura and Kissanagar canal areas. The irrigated tracts between Devi-Mahanadi and Mahanadi -Birupa and Brahmani sectors can be regarded as multi-cropped areas where double cropping is as high as 44 to 50%.

Jute is the principal cash and fibre crop of the Mahanadi delta where it has gained ground since Independence. Now it accounts for 5% of the gross cropped area of the delta, with maximum concentration in Patkura, Kendrapara, Salipur, Mahanga and Patmudai police stations.

Though paddy provides almost a monocultural landscape, in several parts, it is grown in a two-crop combination with pulses, oil-seeds or jute and also in three and four crop combinations with the same crops. Paddy is the first crop followed by pulses. Jute is the premier cash crop. Spatial distribution reveals that the monocultural region lies in the northeastern and south-eastern quarters and the central coastal belt covering 10.87% of the total cultivated area. The two crop combination-regions cover an extensive tract of the middle delta. The 4 crop combination-region accounts for 17.32% of the gross cropped land and is concentrated in the Mahanadi-Nuna and Devi-Frachi interfluves.

The South Balasore plain is dominated by cereals, while the zone covering the entire Maha-

nadi, Brahmani and southern portions of Baitarani deltas form the most important diversified crop region with two distinct sub-zones. Throughout the zone pulses, next to paddy are, extensively cultivated, whereas in the core sugarcane, jute and oil-seeds and 'other cereals' are widely met with. The Rushikulya plain is also important for pulses.

As in the Utkal plains, rice is the dominant crop in Andhra Plain also, which accounts for 50% of the total rice area of the State, mainly in the delta districts of East and West Godavaris, Krishna and Guntur and also in Nellore and Srikakulam. *Bajra* is mainly concentrated in Vishakhapatnam and Guntur while *ragi* is important in Srikakulam, Vishakhapatnam and Nellore. All the coastal districts except West Godavari are notable for pulses. Groundnut is important in Krishna, Guntur, Vishakhapatnam and Srikakulam. Gingili is predominant in Vishakhapatnam and East and West Godavaris. Coconuts are mainly confined to East Godavari. Tobacco and sugarcane are important commercial crops. Guntur alone accounts for 85% of the tobacco acreage of the State. The acreage under sugarcane is considerable in all the coastal Andhra districts except Guntur and Nellore. This crop is mostly grown in Bobbili (Srikakulam), Chodavaram (Vishakhapatnam) and Tanka (W. Godavari) taluks. The cropping pattern of this region has adjusted itself to the existing irrigational facilities, soils and rainfall. In the alluvial soil of the delta where canal water is available for 8 months, a long duration variety of paddy is grown. Paddy forms a monoculture (over 75% of the cropped area) zone along the coastal plain, though not as a continuous belt, in parts of the Krishna-Godavari deltas and Nellore and Srikakulam districts. Around the rice monoculture zone occurs a secondary concentration of rice (50-75%) in association with bajra, ragi and oilseeds. In Srikakulam rice is grown in combination with ragi, while in Vishakhapatnam low lands pulses and oil-seeds also combine with these two crops. On either side of the Godavari delta along the coast in Tadepalligudem taluk in W. Godavari, Razole, Amalapuram and Pitha-

puram in E. Godavari, Bapatla, Tenali and Guntur in Guntur, rice is grown in association with oilseeds except in Bapatla where it is grown with Bajra and tobacco as second crop.

A less significant concentration of rice (20%) is found in parts of Vishakhapatnam where it is grown in association with pulses and oilseeds. In Guntur district tobacco is cultivated generally as a single crop due to poor rainfall except when supplemented by irrigation. The other commercial crops raised are groundnuts, gingili and jute. In the southern part, where black soils are found, jowar and ragi are cultivated in rotation with chillies.¹⁷

In Tamilnadu Plain rice, pulses, sugarcane, cotton, groundnuts, and gingili are the most important crops. Rice is naturally as prominent and widely distributed here as in the other parts of East Coastal Plain. It is largely grown in the Palar, Cauvery and Tambraparani valleys. Double cropping is practised where the deficiency in rainfall is supplemented by irrigation. The principal rice growing areas are Cauvery delta including Chidambaram (S. Arcot), most of Chingleput, eastern part of N. Arcot and northern portion of S. Arcot and the Tambraparani valley. Rice occupies from 77% in Papanasam to 93% in Mannargudi in the delta. But as one goes inland where rainfall decreases and there is a less water-logging, valuable crops like plantains, sugarcane and betel are grown side by side with paddy, though paddy claims more than 50% of the area. Over 76% of the area is devoted to paddy in most of Chingleput and Madurai districts, but acreage decreases from east to west in Chingleput as tank irrigation is replaced by well irrigation. The high concentration in Chingleput is partly due to the close proximity of the city of Madras. The rice acreage in the upper Tambraparani valley occupies over 50% of the cultivated area in Ambasamudram and Tirunelveli taluks. The average acreage decreases eastwards due to the declining rainfall. Millets are not significant in the region: Cholam is grown in the red soils of Tiruchchirappalli and in the black soils of Ramanathapuram. *Kambu* (Bajra) is grown in the black cotton soils of Kovilpatti and

Sattur and red soils of Srivilliputtur and in the northern parts of N. Arcot and Chingleput, chiefly with the help of tank and well irrigation. Ragi is concentrated in the poor soil tracts of Udayarpalyam, Perambalur and Vriddhachalam taluks. The oilseeds grown are groundnuts and gingili, while coconuts are grown all along the coast. The proportion of area under groundnuts in the Tamilnadu State is 13%; over 40% of the State area devoted to groundnuts lies in S. and N. Arcot districts and 15% in Tiruvanamalai taluk alone. Gingili is grown throughout the region with the greatest concentration in Karur taluk (Tiruchchirappalli). Pulses, mainly different types of gram, are grown all over the area mostly as a second crop. Among industrial crops, cotton is mainly cultivated on the western margins of the southern parts, its percentage being highest (25 to 41) in the Ramanathapuram and Madurai districts corresponding with black soil areas. Sugarcane is grown in a small quantity in the Cauvery delta (2 to 3%).

The principal rice monoculture regions are the Cauvery delta (77-93%), Palar basin and Tambraparani basin. Rice-bajra-oilseed zone is formed by Ramanathapuram-Sivaganga and Madhukulathur taluks of Ramanathapuram (rainfall less than 88 cm). Rice-jowar-bajra-oilseeds zone is associated with the taluks of Musiri, Kulitalai, Lalgudi and Udayarpalyam in Tiruchchirappalli and Kalaikurichi, Vriddhachalam and Tirukroilur in S. Arcot. In this area of 75-100 cm rainfall rice occupies 25 to 50% of the total cultivated area. Rice-oilseeds zone is found in Arni, Polur, Chengam, Tiruvanamalai, Cheyyar and Wandiwash in N. Arcot, and Tindivanai, Villupuram and Dalari in S. Arcot. Rice occupies 25-50% in the zone of 88-125 cm rainfall. Bajra-jowar-cotton-rice zone, occupying 25-50% of the cultivated area in different parts with rainfall varying between 60-90 cm, is mainly found in Sattur and Arupukottai in Ramanathapuram and Kovilpatti in Tirunelveli.¹⁸

Intensity of Cultivation : In several areas in the East Coastal plains two to three crops are grown in a year with the help of irrigation. This leads to a greater intensity of cultivation in these particular

tracts. In Orissa Plains the intensity of cropping is highest in Cuttack (128.48%) and Puri (125.48%). This area coincides with the Mahanadi delta and comes under canal irrigation. Balasore (102.10%) and Ganjam (111.5%) have lower intensity. In Andhra Plains the maximum cropping intensity (130.8%) is found in Srikakulam which is well above the State average (109%). The four irrigated coastal districts of Vishakhapatnam (120.98), East Godavari (123.94), W. Godavari (124.35) and Krishna (120.5) have high intensity. Nellore has a lower intensity (108.38). Tamilnadu areas of high intensity (over 150%) are found in lower Palar valley, northern Cauvery delta and upper Tambraparani basin. The remaining parts of the valley have an intensity of 125.15%.

Industry

Industrially the East Coastal Plains are not significant as there is a general lack of industrial raw materials for the development of any large-scale industry. In this Region, Tamilnadu Plain is the most industrialised and Utkal coast, the least. Greater development of industry in Tamilnadu is due to the development of power, means of transport and the momentum of start by British enterprises by setting up several industries to employ educated skilled labour available in plenty (Fig. 28.12).

The Utkal region lacks industrial raw materials, though there is ample supply of labour. The region suffers from lack of power. There is a thermal plant at Chowda and diesel power sta-

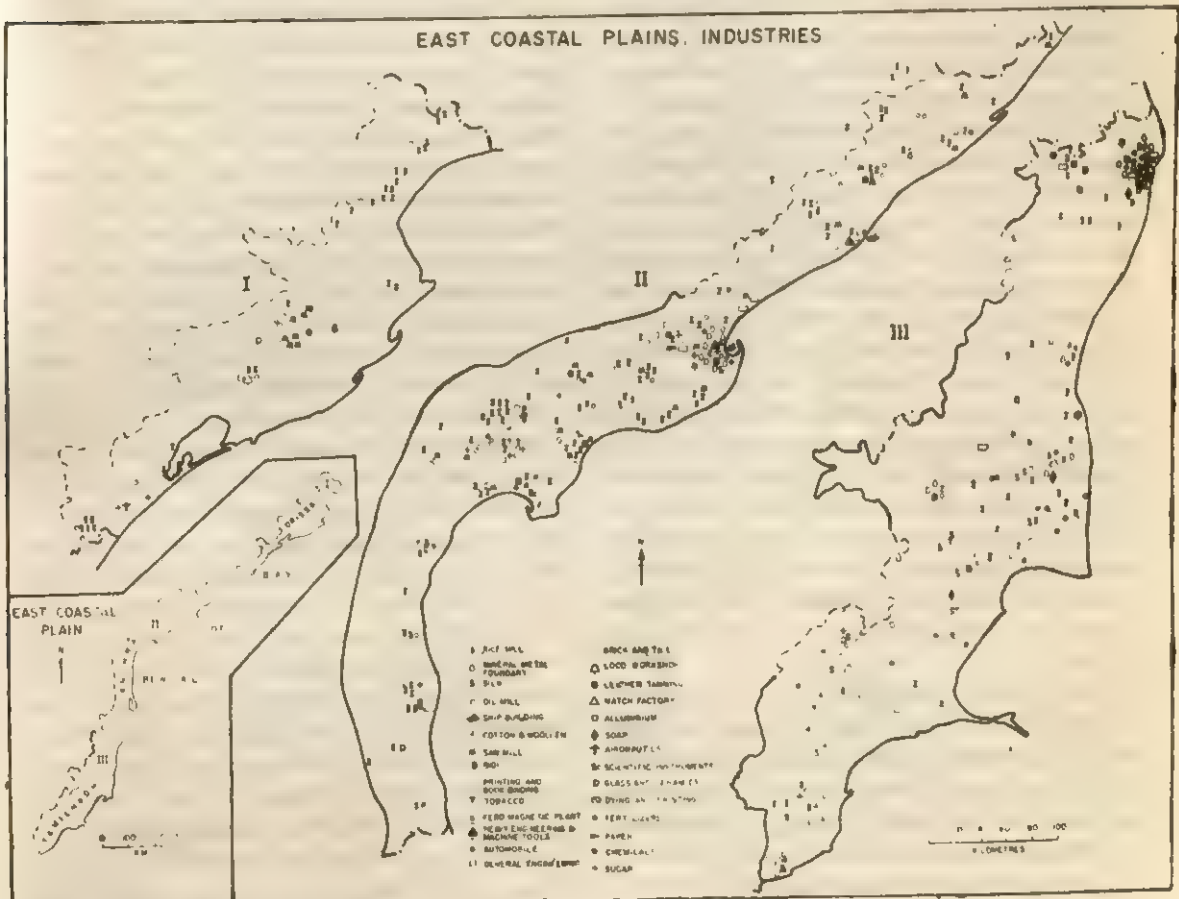


Fig. 28.12

tions in Bhubaneswar, Jaleswar, Bhadrak and Chandbali. These small power stations serve mostly small urban localities. The per capita generation of electricity is very small, and only 1.5% of the rural population enjoys its benefits. There is a general lack of mineral resources, but being densely populated this region provides a market for finished products. Maldistribution of industries is another problem. Most of the large and medium industries are concentrated only in the industrial suburbs of Cuttack, while Berhampur and Puri, the third and fourth largest towns, have only a few industries worth the name. All the industries are located along the Calcutta-Madras railway. The bulk of the agro-based industries of the State, both medium and small, are located in the coastal plain. There are some sporadic developments of modern large scale industries. A ferro-chrome plant at Jaipur Road is operating with the ore supply from the rich mines in the neighbouring areas. Chowduar, the eastern industrial suburb of Cuttack, is the largest single industrial complex of Orissa. Availability of market, transport facilities, skilled labour, and industrial inertia have played significant role in the concentration of such industries as a galvanised pipe factory (capacity, 30,000 tonnes), a cotton textile mill (50,000 spindles and 864 looms, employing 4,000 persons) and a paper mill (18.2 thousand tonnes). Cuttack is also credited with a refrigerator plant since 1950. Barang, the other industrial suburb of Cuttack on the Kathjuri, has a ceramic, glass and refractory unit. Sandwiched between Bhubaneswar, the State capital, and Cuttack, the largest commercial capital, this centre has a bright future for further growth. A railway workshop is located at Kharanda Road, the divisional headquarters of the Southeastern Railway.

Among the agro-based industries, rice mills are naturally the most important. Of the 93 rice mills in the State about 90% are located in the coastal plains employing 18,000 workers and clustering invariably at rail-heads. This apart, there are a large number of power-driven rice haulers, scattered in rural collecting centres to meet the local demand. In the Chilka region fishing is a thriving

industry from where fish are exported to Calcutta. Carving of horn stone at Puri and filigree works of Cuttack are also important.

Not unlike Utkal Coast, the Andhra Coast is little endowed with basic minerals except clays, graphite, feldspar, limestone, etc., and lack of adequate transport facilities has hampered their utilisation. The development of thermal power, particularly at Vishakhapatnam in the north and Nellore in the south, has led to the electrification of rural areas (20% villages); East Godavari has the highest rural electrification (55.6%) and Srikakulam the least (14.9%). The thermal power is largely consumed by industries, Vishakhapatnam being the largest consumer (70%). Some metal-based industries have developed particularly in Srikakulam, Vishakhapatnam and West Godavari. Aluminium products are concentrated in Rajahmundry (with 14 out of 32 factories in the State), Vishakhapatnam and Vijayanagar and brass works in West Godavari (Rajahmundry, Kakinada etc.). Cotton goods are manufactured in Tenali and Kakinada. Forest-based industries are widespread with concentration in East and West Godavari. Cement works are located at Tadepalle (Guntur) and Vijayawada. Pottery and ceramics are important in East and West Godavari and Nellore. As an industrial node, Vishakhapatnam is distinguishable in this region; its ship-building yard with ancilliary industries and oil refinery are outstanding.

In Tamilnadu Coastal Plain as well, thermal power predominates and 1/3 of the power consumed in the region is supplied by Neyveli, the largest thermal power station in the region (cap. 600 M W) based on local lignite. An atomic power station at Kalapakkam, 80 km south of Madras would boost the power supply. It is an outstanding region in rural electrification in the country. The region is fairly well industrialised due to availability of power. The textiles, both on factory and cottage level, are widely distributed with main concentration in and around Kancheepuram, Madurai, Ramanathapuram, etc. The cement industry is located at Dalmiapuram (Tiruchchirappalli), Alamgulum and Tulukpatty (Ramanathapuram) and Talaiyutha (Tirunel-

veli) with a total production of 1.5 million tons; it is based on local raw materials except coal brought from Bengal and Bihar. Chemical industries include a variety of products, oil, petroleum, fertilizers, salts and acids. Oil refinery is set up at Manali, fertilizers around Madras (Manali, Ennore and Ambattur) and Neyveli (using local lignite), and salt at Tuticorin with several smaller centres along the coast. Centres for automobiles have developed within 32 km radius from Madras: Standard car at Vandallur, Leyland trucks and scooters at Ennore and heavy vehicles and armoured cars at Avadi. The Integral Coach Factory at Perambur is also notable as the biggest in Asia. Leather industry at Chromepet is well-known. Tiruchchirappalli is the largest centre of mechanical engineering industries.

A number of miscellaneous industries have grown up around Madras, including typewriters, calculators, teleprinters, amplifiers, film projectors and electrical fittings. There is a plant which produces surgical instruments and a large unit manufacturing safety matches. A number of small units manufacture matches and fireworks around Sivakasi (Ramanathapuram). The State Government has taken steps to develop small scale industries. There are 2 industrial estates in the coastal plain. There are 10,000 small industrial units widely spread in the region owing to the availability of electricity in most of the large villages and towns.

It is evident from the foregoing that there are seven important industrial nodes in the East Coastal Plains : (i) suburbs of Cuttack. (ii) the region around Vishakhapatnam extending up to Rajahmundry, (iii) around Madras, (iv) Neyveli, (v) Tiruchchirappalli, (vi) Madurai and (vii) Tuticorin.

Transport and Communication

Transportation lines run N-S, parallel to the coast. Roads and railways radiate to the interior and thus form a well-integrated transport network (Fig 28.13). N. H. 5 connects Calcutta with Madras via Cuttack, Vishakhapatnam, Vijayawada and extends further south through Tiruchchirappalli and Madurai to Cape Comorin as N. H. 45 and 7.

In Utkal coast roads radiate from six focal points : Balasore, Bhadrak, Jajpur Road, Cuttack, Bhubaneswar and Berhampur. They run parallel to river channels from NNW to SSE and are at right angles to the railroad. Five arterial roads link the sub-division and police station headquarters of the Mahanadi Delta.

With the construction of major bridges over the Mahanadi and its distributaries, Cuttack will be linked with Balasore and Sambhalpur by all-weather roads. After the bridge over the Rupnarayan in W. Bengal is completed, a through link with Madras will be established. The express highway linking Daitari mines with Paradeep port has gone a long way in solving the ore transportation problem to the port for export. The highway has opened up new hinterlands for Paradeep.

The coastal plains of Orissa are mostly accessible up to 4 km to the nearest road. Slightly inaccessible areas of 4 to 8 km are more widely distributed, with a few patches of inaccessible areas.

The railroad from Calcutta to Madras touches the apex of the delta at Balasore, Bhadrak, Jajpur Road, Cuttack, Bhubaneswar, Khurda Road and Berhampur forming roughly the western border of the coastal plain. The main line has often been subject to breaching between Balasore to Cuttack and Khurda Road to Berhampur during the floods. These disrupt the through traffic between Madras and Calcutta.

The only branch line from Puri to Khurda Road and the new constructed railroad from Cuttack to Paradeep will open up new hinterland. Chandbali and Gopalpur, the minor ports, should be linked by railway with Bhadrak and Berhampur respectively for the optimum growth of the coastal plains.

The existing navigation canals serve only the Cuttack district. These are Taladanda canal, Kendrapara canal, Gobari canal and High Level Canal Range I and II. Bulky non-perishable goods like building materials, salt, grains, fire wood etc., are transported through them. The canals need be dredged and lined so that powered crafts can also use them. At present the major port at Paradeep has a large and somewhat natural har-

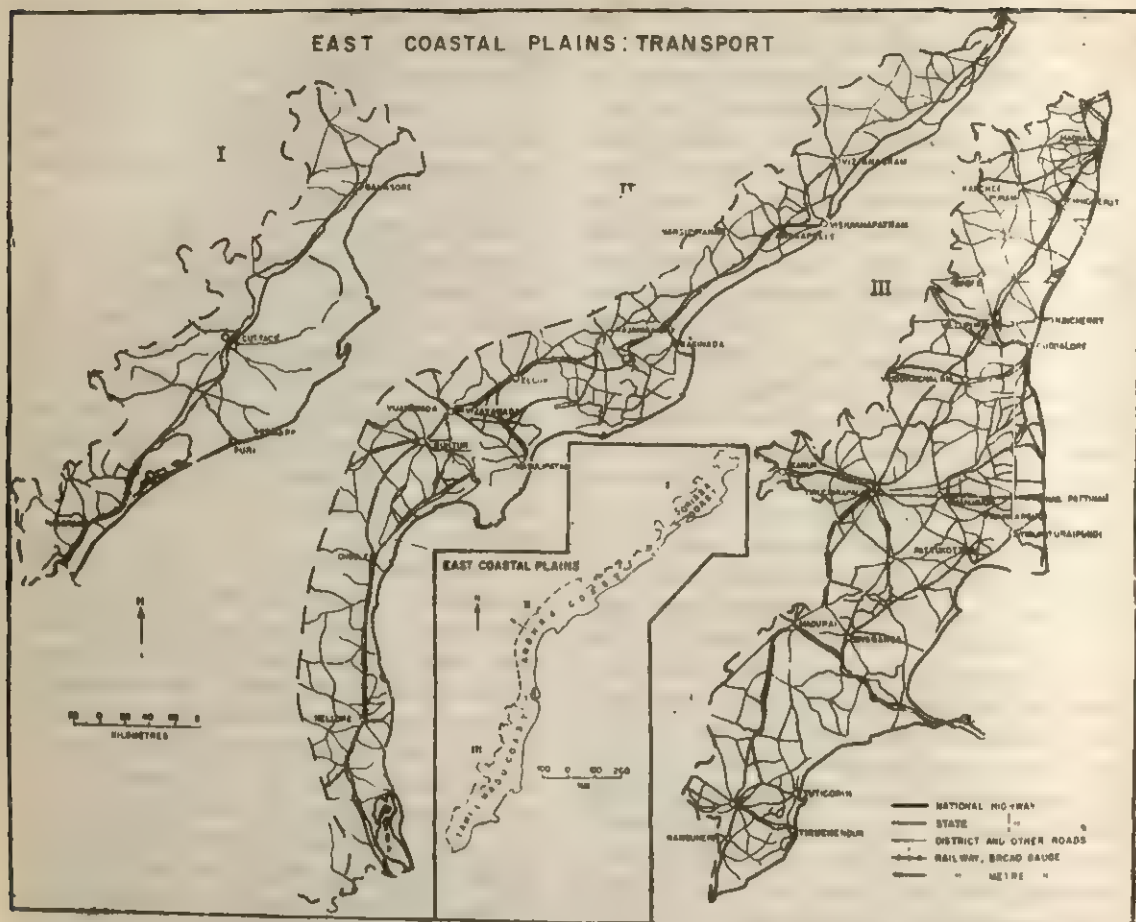


Fig. 28.13

bour. Once it is linked by the rail-road with Cuttack it will boost up the economy of the delta considerably.

Bhubaneswar has the only aerodrome in the Utkal coastal plains and is served by I.A. C. flights from Calcutta and Hyderabad via Vijayawada.

Except for one State Highway branching from N. H. 5 to Kakinada, there is no other highway in the Andhra Plain. Other roads connect both the small and large towns making most of the region accessible. In addition to Calcutta-Madras broad gauge railway line, a metre gauge line runs between Guntur and Rajahmundry, which can be double-tracked in the interest of developing Masulipatam. The Vijayawada-

Masulipatam line should also be converted into broad gauge.

There are about 23 large and small canals in the Krishna-Godavari deltas including the Buckingham Canal, but most of them are out of use. Some of these canals, if developed and maintained, would provide inland waterways. Elluru-Samalkot and Masulipatam canal may be developed to feed the Kakinada and Masulipatam ports.

In Tamilnadu Coastal Plain region, Madras is the strongest regional node; N. H. 4 radiates from here westwards to Bombay via Bangalore and N. H. 46 bifurcates to Vellore. A State Highway branches off from N. H. 45 and runs westwards through the Attur gap. A second State High-

way runs westwards from Palayamkottai to Quilon through the Shencottah gap. Other State highways run eastwards from the nodal centres on the National Highways to the coastal towns of Cuddalore, Nagapattinam, Rameswaram and Tuticorin. The National and State Highways and district roads have developed important nodal centres at Tiruchchirappalli, Madurai, Thanjavur and Palayamkottai. N. H. 49 links Madurai with Rameswaram.

Chingleput, S. Arcot and Thanjavur are well served by roads with only a few inaccessible patches (8 to 16 km). Most of the settlements lie within 8 km from the surfaced roads. The inaccessible patches correspond with the hilly margins of the region. The southern districts have a comparatively larger number of inaccessible patches, especially in the drier sandy regions of Ramanathapuram, mainly owing to irregular nature of the terrain with low density of population and less industrial growth. Road links are necessary for adequate development of the ports of Tuticorin and Cuddalore.

The railways are mainly metre gauge lines in the south and east. Only a few kilometres of broad gauge lines are found to the north and west, from Madras to Gudur and Arkonam, etc. The metre gauge line runs southwards from Madras passing through Villupuram, Tiruchchirappalli, Madurai and Palayamkottai and to Trivandrum through Shencottah gap. Another metre gauge line runs close to the coast from Madras to Rameshwaram. Branch lines extend eastwards to Pondicherry, Cuddalore and Nagapattinam. A line runs westwards to Salem through the Attur gap and another from Virudunagar to Tenkasi on the main line; Madras-Villupuram section has been electrified.

The northern coastal plains have better railway facilities than the southern counterpart in Tamilnadu. Most of the towns and cities in the former lie 8 to 16 km from the nearest railway station except N. Arcot and some patches in Chingleput, Tiruchchirappalli and Thanjavur. In the southern plains, on either side of the railway line connecting Madras and Rameswaram, two very high and highly inaccessible (over 32 km) big patches are

found. The Nanguneri taluk (Tirunelveli) is a highly inaccessible area extending into Kanya Kumari.

Madras has an international airport at Meenam-bakkam and is well-connected by air with other parts of India and abroad. Madurai and Tiruchchirappalli have air transport facilities connecting other cities in the South.

The Regions

The East Coastal Plains are delimited from the adjoining Eastern Ghats, primarily on the basis of physiography and structure. The boundary of the foot-hill zone roughly coincides with 75 m contour in Orissa, 100 m in Andhra Pradesh and 150 m in Tamilnadu. The region is divided into three first order, nine second order and 22 third order regions (Fig. 28.14):

63. *Tamilnadu Coastal Plains*

- (a) The Palar-Ponnaiyar Basin or Northern Coastal Plain
 - (i) Madras Metropolitan Region
 - (ii) Lower Palar Valley
 - (iii) Lower Ponnaiyar Valley
 - (iv) Interfluvial Tracts
- (b) The Cauvery Valley and Delta or Central Coastal Plain
 - (i) The Cauvery Valley
 - (ii) The Cauvery Delta Region
- (c) The Vaigai-Tambraparani Basin or Southern Coastal Plain
 - (i) East Ramanathapuram Lowlands
 - (ii) West Ramanathapuram Lowlands
 - (iii) The Tambraparani Basin

64. *Andhra Coastal Plains*

- (d) Srikakulam-Vishakhapatnam Lowlands or Northern Plain
 - (i) Srikakulam Region
 - (ii) Vishakhapatnam Region
- (e) The Krishna-Godavari Delta or Middle Coastal Plain
 - (i) Godavari Delta
 - (ii) The Elluru Region
 - (iii) Krishna Delta
- (f) Nellore or Southern Coastal Plain
 - (i) Nellore Region North
 - (ii) Nellore Region South

65. Orissa or Utkal Coastal Plains

- (g) The Northern Coastal or Balasore Plain
 - (i) The Subarnarekha Lower Valley
 - (ii) The Budhabalanga Lower Valley
- (b) The Middle Coastal Plain or Mahanadi Delta Region
 - (i) The Salandi-Baitarani-Brahmani Delta
 - (ii) The Mahanadi Delta.
- (i) The Southern Coastal Plain or Chilka Region
 - (i) Chilka Plain.
 - (ii) Berhampur Plain.

The first order regions coinciding with the administrative boundaries of each State from

north to south are the Orissa or Utkal Coastal Plains, the Andhra Coastal Plains and the Tamilnadu Coastal Plains. These boundaries also correspond with the linguistic and cultural boundaries of the Oriya, Telugu and Tamil.

The Utkal Coastal Plains are further divided into three second order regions on the basis of morphological peculiarities and climatic and edaphic conditions. The boundaries are adjusted to the differential patterns in economic activities, like agricultural development or land use pattern, pressure of population, occupation of the people and transport and communication facilities; these sub-regions are : (i) The Northern Coastal Plain or Balasore Plain; (ii) the Middle Coastal

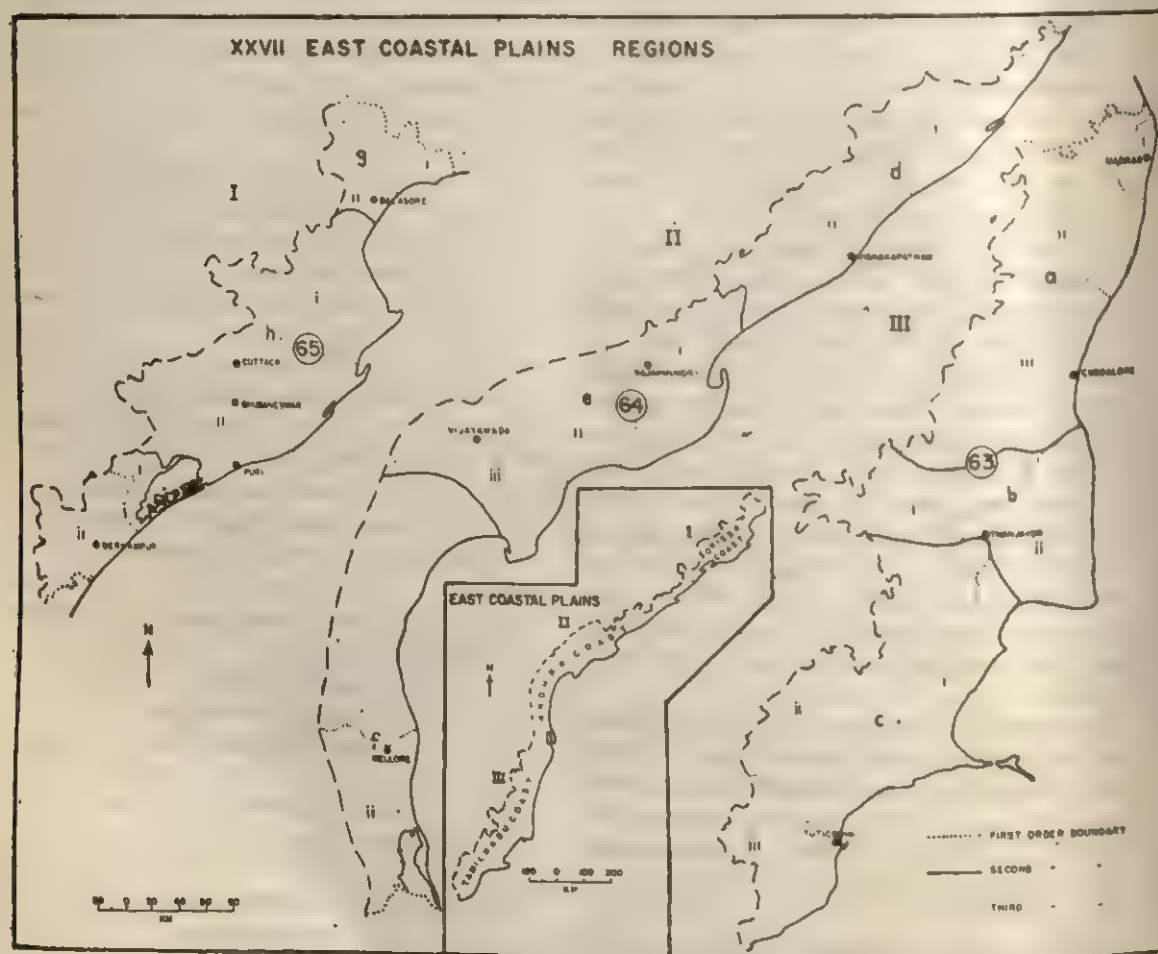


Fig. 28.14

Plain or Mahanadi Delta, and (iii) the Southern Coastal Plain or Chilka Region.

The Balasore Plain comprises of the flood plains and deltas of the Subarnarekha and Budhabalanga rivers and roughly covers the whole of Balasore district. This is narrow in extent and bears evidence of marine transgression as shown by marine deposits. Lack of active development and absence of fan-shaped deltas on the river mouths differentiate it from the rest of the Coastal Plains of Orissa. Economically the area is under-developed as compared to the other coastal areas; it not only lacks irrigation facilities, but it has also been a region of depopulation during the last half century (1901-51). It is one of the worst flood- and drought-affected areas of Orissa. The floods inundate the lower plains and the region also lies in the direct path of the cyclones from the Bay of Bengal. Low per hectare agricultural out-turn, lack of double cropping and crop failure are some of its distinguishing characteristics. The economic activity of the area is controlled by Balasore (33,931) which has a very slow rate of population growth. This region is, however, a surplus paddy area and has now majority of rice mills of Orissa. The region can be further subdivided into : (a) Subarnarekha Lower Valley, and (b) Budhabalanga Lower Valley.

Mahanadi Delta is composed of the combined deltas of the Salandi Baitarani, and Brahmani in the north and Mahanadi in the south. Here the plain is widest. The actual delta growth, the presence of back bay at Aul and Kendrapara and the lakes like Sai and Sonang in the Puri coast are some of the peculiarities which differentiate it from other portions of the coast. The presence of an extensive irrigated area and insurance against annual inundation by a well co-ordinated embankment system lead to a maximum pressure of population and high yield per unit of land in Orissa. Extensive areas are not only double-cropped, but instances of triple cropping are also not lacking. Cultivation of jute is extensive. The presence of tidal forests, known as "Little Sundarbans" in the river estuaries, recent fluviatile deposits in the lower reaches and the older alluvium are notable. Some of the oldest towns of Orissa like Cuttack,

Puri, Kendrapara and Jajpur are also located here. The agricultural prosperity of the area will be further accentuated after the Salandi and delta irrigation projects are completed. The port of Paradeep will boost the economy of the region. The newly constructed express highway from Daitrani mines to the port and the proposed rail link from Cuttack will open up new hinterland area for the port.

Bhubaneshwar (38,211), the State Capital, is a modern planned town. Cuttack (146,308) and Paradeep will continue to be the commercial hubs of the region. Cuttack is the largest city of the State, while Puri (60,815) is one of the most important religious centres of India. Chowduar (13,478) is an industrial suburb of Cuttack. The region can be further subdivided into : (i) The Salandi-Baitarani-Brahmani delta and (ii) The Mahanadi delta.

The Southern Coastal Plain or Chilka Region is completely cut off from the Middle coastal plain by the Chilka lake and the spurs of the Eastern Ghats. It is built up by the fluviatile deposits of the Rushikulya. Unlike the Mahanadi delta there is absence of a well-developed fan-shaped delta, dead level flat plains and back-bays or well-developed lagoons. The undulating topography has limited the irrigation to favoured tracts. The higher frequency of failure of rainfall and rainy days often leads to crop failures here. Relatively it is better served by roads. Berhampur (76,931) controls the economic activity of the region and is the third largest town of the Utkal Coast. The region may be subdivided into two third order units : the Chilka Plain and the Berhampur Plain.

Andhra Coastal Plains : Based on physical factors and economic activities, the Andhra coastal plains, like the Utkal plains, can be divided into 3 second order regions : the Srikakulam-Vishakhapatnam Lowlands or Northern Coastal Plain, the Krishna-Godavari Delta or Middle Coastal Plain and Nellore or Southern Coastal Plain.

Srikakulam-Vishakhapatnam Lowlands cover Srikakulam (excluding Sallur and Parvatipuram) and Vishakhapatnam (excluding Chintapalli and Paderu taluks) districts. The lowland narrows

down to 19 km under Mahendragiri, but on either side of this gate are embayments of the Rushikulya and the Vamsadhara. The black soil of the valley floors grades upwards to red soils. There are numerous gneissic outcrops. Vishakhapatnam lies between the Kalina ridge (490 m) and Yaroda (335 m), the latter running into the Dolphin's Nose which shelters the harbour. Rice covers a third of the cultivated area, followed by ragi, oilseeds, millets and pulses. Mineral resources are few, limited only to graphite, kaolin, and mica. Industrial development is confined mainly to jute and rice mills, and ship-building. Vishakhapatnam is the only city and port of importance. The hinterland of the port extends to Nagpur and Raipur and serves the highly mineralized belt of Madhya Pradesh and nearby areas. A steel plant for Vishakhapatnam is being seriously considered.

The *Srikakulam region* is more agricultural and less developed than the Vishakhapatnam region which is fairly urbanized and industrialised.

The *Krishna-Godavari Delta* includes the lowlands below Vijayawada and Pollavaram forming the twin-delta. These lowlands are vulnerable to floods and cyclones but form a vast expanse of rice-fields and are reputed as the "Granary of the South". Between the two deltas lies the Elluru Region where the Koleru Lake occupies a depression cut off from the sea by siltation and serves as a good fishing ground; this region is transitional in character with Elluru (108,311) as the regional hub. The twin delta region is essentially agricultural with 80% of the area under paddy. In places jowar, sesamum and groundnuts are cultivated. Rajahmundry (130,002) and Kakinada (122,865) are notable in the Godavari delta, while Vijayawada (230,397), Guntur (187,122) and Masulipatam (Bandar : 101,417) are regional centres in the Krishna delta.

Nellore Coastal Plain is a transitional belt between the Andhra and Tamilnadu plains. It is physically dominated by tank irrigation except for canal irrigation in the Penner valley. Most of the plain is cultivated mainly for jowar, followed by rice, cotton and groundnuts. The most important coastal feature is the great salt water lagoon of

Pulicat. Gypsum is an important mineral, and laterite an important building stone. Nellore (106,776) is mainly administrative and commercial and has developed pottery and ceramic industry. Its *Northern region* is thus distinct from the *Southern* which is greatly influenced by Nellore city.

Tamilnadu Coastal Plains can also be divided into three second order regions on the basis of coastal morphology and economic attributes : the *Vaigai-Tombapurani Basin* or Southern Coastal Plain, the *Cauvery Valley and Delta* and the *Palar-Ponnaiyar Basin*.

The *Palar-Ponnaiyar Basin* includes the districts of Chingleput, S. Arcot and part of N. Arcot and Tiruchchirappalli. This Northern plain is traversed by the lower courses of several rivers such as the Arni, Kortalaiyar, Adyar, Cooum, Palar, Ponnaiyar and Vellar. Most of these rivers are small, but the Palar, Ponnaiyar, and Vellar are important because of their agricultural significance for rice, sugarcane, betel-vine and flowers. Tank and river channels are the main sources of irrigation. Groundnut is grown in the irrigated tracts and North Arcot is most important district for its production. The region is also important industrially. The industrial complex around the city of Madras falls in this zone with oil, chemical, automobile, railway coaches, leather goods, fertilizers, textiles, etc. There is a sugar factory set up in Padadam. Kancheepuram and Arni specialize in handloom, silk weaving, etc. Other notable centres are Pondicherry, Cuddalore and Chidambaram. Smaller towns include Tiruttani, Tindivanam, Villupuram, etc., which are fast growing.

On the basis of resource development this region can be further subdivided into : (i) *Madras Metropolitan* region which is distinguishable by its industrial and market garden landscape and (ii) *Lower Palar Valley* including the valleys of the Palar and Cheyyar, which has intensive agricultural development based on canal and well irrigation. Industries like silk and handloom are also important. (iii) *Lower Ponnaiyar Valley* comprising the narrow coastal tract from Pondicherry to the Coleroon with rich alluvial soils has emer-

ged as paddy and sugarcane region, mostly based on tank irrigation. Groundnut is grown in the irrigated tracts. A number of urban centres like Pondicherry, Cuddalore and Chidambaram are located here. (iv) *Interfluvial Tracts* are located between the Palar and the Vellar. These tracts are at higher elevations than the valley floors and are subject to widespread soil erosion. A number of medium-sized towns like Chingleput, Ponneri, Arni, Tiruttani, Vriddhachalam, Villupuram etc., are notable.

The *Central Region* includes the lower Cauvery valley from the confluence of the Amravati with the Cauvery up to Tiruchchirappalli; the valley is narrow and well defined by gradually rising interfluvial tracts to the north and south. The Cauvery splits up into distributaries east of Tiruchchirappalli forming an extensive delta which is largely agricultural due to canal irrigation. Most of the cultivated area is double cropped being dominated by paddy. Density of population is high and there are several urban centres. The region has rice, sugar and other agro-processing industries. The region can be sub-divided into the *Cauvery valley* between Karar and Tiruchchirappalli and the *Cauvery delta* with Thanjavur as the regional focus.

The *Vaigai-Tambraparani Region* covers all the area south of the Cauvery Valley and Delta. Though a number of rivers such as the Vaigai, the Vaipar, etc., drain the region, the valleys are not well-defined topographically. The region has an undulating surface with a network of interconnected tanks. It may further be divided into the *Tambraparani Basin*, *East Ramanathapuram Lowlands* and *West Ramanathapuram Lowlands*. The Tambraparani Basin is the most fertile agricultural region in the south. The basin receives rainfall from both the monsoons and has a good network of irrigational facilities from canals and tanks fed from anicuts across the river. The region has a high density of population having large and small-scale industries. Tirunelveli is the regional centre, while Tuticorin is the main port. East Ramanathapuram Lowlands include the southern parts of the Thanjavur and Tiruchchirappalli districts. This region has poor rainfall and generally

infertile soils, but has a close network of rainfed tanks and is studded with villages. It carries a low population density and has poor transport facilities. The area is frequently affected by drought. West Ramanathapuram Region includes the northwestern portion of Tirunelveli, eastern part of Madurai and western part of Ramanathapuram lowlands. There are a number of large urban centres such as Madurai, Virudhunagar, Aruppukkottai, Sattur, Sivakasi, Srivilliputtur, etc., which have a variety of large and small scale industries like textiles, cement, matches and fireworks, etc. The region receives more rainfall than the eastern part and cotton is an important crop. It also enjoys better transport facilities by road and rail.

Problems And Prospects

The Region is a surplus food area and is characterised by intensive agriculture. It is also an area of high pressure of population with a fairly high degree of urbanisation. The region, though well-served with transportation facilities, needs better inter-connection through constructing a trunk marine drive from Calcutta to Kanya Kumari, and providing links to the ports.

Though well-developed industrially in some parts, there is still good scope for rapid economic development. The development of the iron and steel industry along with the ancillaries at Salem will provide great impetus to the regional industrial development. Fishing industry, particularly sea fisheries, has a good prospect if modern equipment, marketing and storage facilities be made available. Port development is a *sine qua non* for augmenting coastal and overseas trade. There is congestion of transshipment of bulky goods from broad to metre gauge railways, especially for goods bound for the southern districts. In order to avoid these problems the existing harbour facilities for Madras, Vishakhapatnam and Paradeep need be improved and enlarged. Characteristic port industries could also be developed to boost the regional as well as the hinterland economy.

To provide for more extensive trade facilities, other ports like Kakinada, Masulipatam, Pondicherry, Cuddalore, Nagapattinam and Tuticorin

could be further developed to activate the respective hinterlands. Paradeep, apart from handling the existing traffic, could also serve Rourkela

industrial complex.¹⁹ The obstacles presented by the tidal marsh at Paradeep are, no doubt, challenging.

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The two groups of islands, the Arabian Sea Islands (Laccadive, Minicoy and Amindivi) and the Bay of Bengal Islands (Andamans and Nicobars) differ significantly in origin and physical characteristics. In all, there are 247 islands of which the Arabian Sea group (8° - $12^{\circ}20'$ N and $71^{\circ}45'$ - 74° E) comprises 25. The Arabian Sea Islands have an average elevation of 3-5 m with an area of 108.78 km² and population, 24,108 (1961). Only about 25% of the area is inhabited. The shortest distance from the mainland (Calicut) is about 108.78 km. The southernmost island (Minicoy) is separated from the rest of the group by the 9° Channel.

The Bay Islands ($6^{\circ}45'$ - $13^{\circ}45'$ N and $92^{\circ}10'$ - $94^{\circ}15'$ E) extend for about 590 km with a maximum width of about 58 km in a crescentic shape. The maximum elevation (Saddle peak) is 750 m, representing the Tertiary fold axis. The total area of these islands is about 8,326.85 km², with a population of 63,548 (1961). The Andaman and Nicobar group of Islands are separated from each other by the 10° channel with a uniform depth of 400 fathoms and an approximate width of about 128 km. The shortest distance from the mainland mass (the Bay head) is about 220 km.

These islands, situated as they are, form the foot-stools for the Indian strategy over the Indian ocean since the gradual withdrawal of the British Navy from the scene, and particularly in view of the growing interest of the two super-powers, one led by U. S. A. and the other by the Soviet Union; while Japan is confined to the Pacific, the Chinese are peeping through some strategic land windows.

The Arabian Sea Islands

Historical Background : An expedition from Cranganore is said to have been shipwrecked on a

Laccadive island,¹ the survivors of which settled down there. They were converted to Islam about 200 years later. These islands came under the rule of Kollattari Raja who later gave the control of Laccadive islands to the Ali Raja of Cannanore in lieu of fixed annual tribute. In 1786, Ameri and the other northern islands of Kittan, Kadamath (Cardamom) and Chetlat revolted against the Bibi, the then ruling princess and declared their allegiance to Tipu Sultan. With the cession of the Malabar district to the British in 1792, the Bibi was allowed to remain in normal possession of Laccadive islands subject to payment of tribute.

After the death of Tipu Sultan in 1799, Ameri, Chetlat, Kadamath, Kittan and the then uninhabited Bitra were attached to the collectorate of South Kanara, and Agathy, Kavarathi, Androth, Kalpeni, Minicoy and the uninhabited Suheli were attached to that of Malabar. During the control of Ali Raja, they were governed by his agents called *Karyakars* assisted by heads of the islanders' families.

The British appointed an *Amin*, subordinate to the Collector of Malabar to govern each inhabited island. The Amins belonged to the local families of high status such as *Karanava* or *Koya* sect, who in turn were assisted by assessors from the same community.

For Amini group of islands the British had appointed resident managers, assisted by accountants called *Karanis*. These islands were under the Judicial District Magistrate of South Kanara till November 1956, when they were constituted into a Union Territory. This administrative system is still continuing under an I. A. S. Administrator with headquarters at Kavarathi which occupies a central location.

Before the administration was taken over by the Union Government, the property was assessed in terms of coconut palms. Now the Government has introduced a landed property system by surveying the land. This change is yet to be digested by the local people.

Till 1967, the islands were represented in the Lok Sabha by a nominated member but since the General Elections in 1967, they are represented by an elected member.

The Physical Setting

The Laccadive Islands (*Laksha dweep*, literally hundred thousand islands) are a group of 25 islands reposing in an emerald sea. Hills and streams are conspicuous by their absence. In general, the lagoons are on the western (windward) side and relatively steep slopes predominate along the eastern margin except in the Androth island which extends east-west. The western arc of the reef is a line of coral rocks, visible only at low water with one or more outlets to the open sea. Inside the reef is a shallow lagoon, large enough to act as a harbour for a native craft, and so sheltered by the reef that even in the worst weather coconut fibres can be soaked in it without danger of being washed away. Outside is a gradually sloping bank of dead coral, which varies from about 90 m to one km in width and ends abruptly in a precipice, at which there is a sounding drop suddenly from 20 fathoms to over 200.

These islands are of coral origin which developed around volcanic peaks. It seems that they first rose to the surface in the form of shallow oval basins, and that under the protection of the reef the eastern rim gradually developed towards the centre, forming the islands. This process of development towards the centre of the lagoon is still going on in some of the islands while in Androth it is practically finished and no lagoon is left. Identical in structure and formation, the islands rise no more than 5 m above the sea and are of varied size and measure from barely a metre to 10 km across (Fig. 29.1).

The northernmost group is collectively known as Amindivi Islands (Chetlat, Kittan, Kadamath,

Amini and Bitra) and the rest as Laccadive Islands (Androth, Kavarathi, Agathy and Kalpeni). In the extreme south is the Minicoy. The inter-island distance varies from 31 km to 175 km except between Amini and Kadamath which are only 9.24 km apart. Many of the islands are very small (Bitra 0.13 km²). The Minicoy is the largest and most advanced of the group with an area of 4.53 km², representing 1/10th of the total land area of the inhabited islands. Minicoy, by virtue of its strategic location, is important for the naval defence of the country.

In 1885, a light-house (45 m high, 30 km light throw) was built to prevent shipwrecks on the coral reefs. The lagoons provide sheltered harbour for the fishing boats.

A weather observatory was installed at Minicoy in 1891 and was upgraded to class I observatory in 1963. In the islands, the climatic conditions do not show much variation.² As a matter of fact, the region remains muggy throughout the year as the wet bulb temperature never falls below 23.8°C, and the relative humidity remains above 72% (Fig. 29.2). The highest temperature recorded at Minicoy and Amini are 36.7°C (1932) and 37.7°C (1960) whereas the lowest recorded are 17.2°C (1947-48) and 18.3°C (1910) respectively. The mean annual total rainfall recorded at Amini is 2,550.4 mm and at Minicoy 2,247.6 mm. The maximum rainfall in a single month during the last 65 years at Amini was 835.7 mm (June, 1924) and at Minicoy 625.6 mm (May, 1933). Throughout the year there is always some cloud cover.

Beneath a thin layer of vegetal humus there is fine coral sand extending at the surface of all the islands; below this comes a compact crust of fine conglomerate that looks like coarse oolitic limestone with embedded bits of shell; beneath the crust of coral stone, there is another layer of fine sand, and then at a depth of about 2 m from the surface the ground water is tapped.³ The coral stone being easy to cut and hard when exposed to air, serves as good building stone.

Although the coconut palms grow luxuriantly in these islands, it is not an easy job to prevent them from the rat menace, which has to be seen

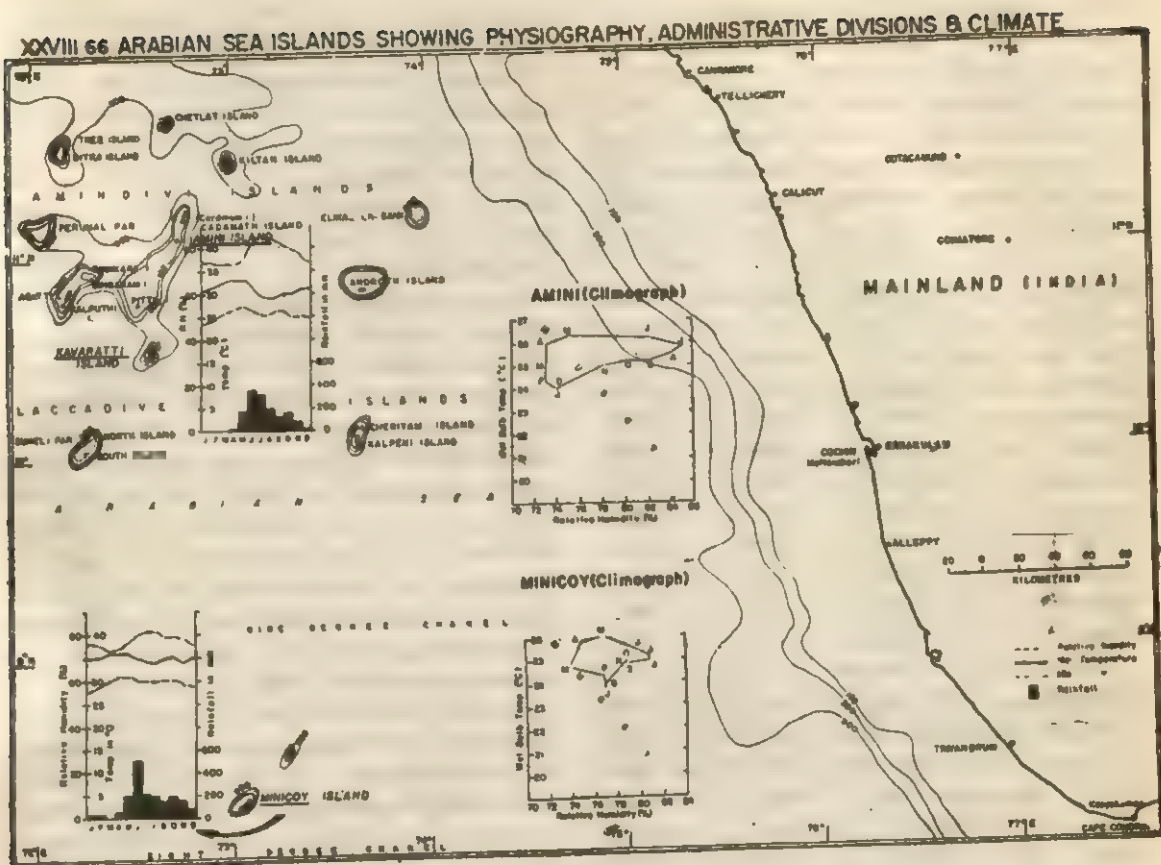


Fig. 29.1

to be believed. There is a large number of these rodents which climb up the coconut trees and live on their top destroying the fruits. To deal with the 'rat' menace, cats, owls and even non-poisonous snakes were introduced from the mainland and allowed to multiply. This did not touch even the fringe of the problem. This is probably because of the fact that they could thrive on fish, available in plenty from the catches made by the people. Another approach to the problem, which could meet with some success is 'Operation Rat' in which all the male population joins.⁴ During the Second Five Year Plan period a large scale rat-eradication programme was launched. It is estimated that about 20-30% of the agricultural yield is usually destroyed by rats.

The Cultural Setting

Population : Only one-fourth (28.49 km²) of the

total area (108.7 km²) of the islands is inhabited with a total population of about 25,000 persons (1967). The region had a total population of about 21,035 in 1951 and 24,108 in 1961 with a sex ratio of 1,020.⁵ The decade 1951-61 has shown an increase of 14.61%. The crude density is 843 persons per km². About 99 percent of the total population are Moplahs of Malabar origin. The percentage of literacy is 23.3. Education is free in all (39) educational institutions. Scholarships and other facilities are provided for higher education on the mainland. During the Third Five Year Plan Rs. 18.83 lakhs were spent on the advancement of education. About 51.6% of the total population form the workers. Only 1.1 percent of the working population is engaged as cultivators 82.7% of the total working population is engaged in house hold industry,

4.6% in fishing, 2.6% in construction, 1.1% in transport and 4.4 percent in other services.⁶ Industries other than household are run by oil engines engaging 3.5 percent of the working population. Electricity was introduced during 1962-63 in Minicoy, Amini and Kavarathi, and there is a scheme to extend it to all the islands?

TABLE 1

Islands	Area (km ²)	Population	Density per km ²
Minicoy	4.53	4,138	911
Kalpeni	2.64	2,613	1,000
Androth	4.32	4,183	967
Agathi	2.73	2,411	897
Kavarathi	3.49	2,828	809
Amini	2.51	3,531	1,406
Kadamath	3.03	1,851	611
Chetlat	1.02	953	946
Keltan	1.66	1,520	943
Bitra	0.12	80	618

The People : Ethnologically the people of Minicoy are different from those of other islands. They are descendants of the early settlers from Ceylon who were originally Buddhists and were later converted to Islam. They are darker and smaller than the other islanders. As in other islands, they are divided into four social classes namely *Manikfan*, *Thakrufan*, *Thakru* and *Raveri*; the first two wield social influence, holding government offices and own shops. The *Thakrus* are the sailors and fishermen, while the *Raveris* are the oarsmen of fishing boats and cultivators.

While Minicoy reveals separate culture, close communal bonds and social disciplines, the social life of the remaining islands, Laccadive and Amindivi, is akin to those of the Muslims of the Malabar coast. The people follow the matrilineal *Marumakkathayam* inheritance laws in vogue on the coast. Dress, food habits and social ceremonies are also similar. These islanders are divided in three classes, the *Karanavas* or *Koyas*, *Malmis* or *Urukars* and *Melacheries*. The *Koyas* are the traditional landed class, the *Malmis*, the Sailors and the *Melacheries*, the labour class, who collect the coconuts, plough the lands and do

other menial services. These distinctions are, however, gradually on the wane.

The people of Laccadive and Amindivi islands as a rule are of fine physique, simple, peaceable and contented, and serious crime is almost unknown. They speak Malayalam, with local variations, but it is written in Arabic script, whereas the people of Minicoy speak *Mahl*, the language of the Maldivian islands.

In the village of Minicoy the people live in a compact settlement which is divided into ten quarters or wards. Each ward is provided with adequate sanitary facilities. There are no roads but foot paths. During the Third Five Year Plan dirty tanks and lagoons were cleaned. In the islands women are a force to reckon with. Marriages take place at an early age. Though Muslims, they are strictly monogamous, and the women take the lead in every thing except navigation. A girl's consent has to be obtained before marriage, and she brings no dowry but receives presents from the bridegroom. *Marumakkathayam*, the succession in female line, is in practice and the husband stays permanently in his in-laws' house. The people in the other islands are polygamous.⁶ Women folk do not observe *purdah* and are free from other social fetters.

Women have their own clubs known as *Varangis* where they discuss all domestic, social and economic problems; the corresponding men's clubs are known as *Athiris* and as a rule all resolutions passed by the *Varangis* are accepted by the *Athiris*. There is close cooperation between the elected Headman and Headwoman known as *Moopans* and *Moopathis* respectively.

The *Athiri* assembly, presided over by the *Moopan*, decides about the general management of its affairs and provides the working force for the conduct of community jobs like construction of houses, hauling or launching of boats, plucking of coconuts, fishing etc. The *Moopani* decisions prevail over the *Athiri* assembly and disobedience leads to social boycott. The work allotted to the women of the *Athiri*, such as collection of firewood, processing of dry fish etc., is guided by *Moopathis*. The men of Minicoy are expert

sailors and many of them seek ship and other minor maritime jobs. They remain absent from their homes for months together and the families are looked after by the women-folk.

Agricultural Economy : The cultivation of coconuts is the main agricultural activity which also constitutes the major economic wealth of the people. The soil and climatic conditions are specially favourable to the growth of coconut palms. Both the tree and the nut are smaller than those of the mainland, but the trees bear much more quickly. Almost the entire area has been planted thickly with coconut with little scope for further expansion.⁹ The total area under this cultivation is about 2,600 hectares. In fact, the economy of the island is directly based on coconut cultivation.

Another perennial crop is the bread fruit, which grows luxuriantly in all the islands; citrus fruits, drumsticks, coarse grains, pulses, vegetables and plantains are grown in kitchen gardens. In most of the islands the coral substratum has been quarried out in patches and the damp sub-soil of sand laid bare for cultivation. There the patches of arable land, which are known as *tottam* or garden, are used for raising ragi, yams and other vegetables. No rice is grown and the requirements of the islands are met from the mainland.

Agriculture Department introduced the use of artificial manures, vegetable seeds and agricultural implements during the Third Five Year Plan. Insecticides are supplied free to the islanders. Paddy cultivation, started on an experimental basis in 1967 to diversify the agricultural base, as inter-cultivation with casuarina plants wherever possible, is proposed to be extended to about 120 acres in Androth and Kalpeni islands.

Industry : There are no large scale industries and the household industries form the backbone of the economy. Majority of the working population is engaged in coir-pinning and copra making which are receiving all the technical and financial aids and marketing facilities for development. Coir Training-cum-Production centres have been established on these islands, where improved methods of coir twisting on *Charkhas* (spinning wheel) have been introduced and over

800 people have been trained in this new technique.

The articles of daily use are made available by cooperative societies functioning on different islands. About 65% of the yield is exported as copra to Andhra Pradesh and Maharashtra.

Fishing and Canning : Island jaggery and vinegar manufactures are of secondary importance. Processing of *Mas* fish is an important cottage industry in Minicoy. The bonito fishing industry, which was the monopoly of the Minicoy island has now been extended to the Kavarathi and Agathi islands. But the large fisheries potential remains unexploited. The fishing season in the deep sea extends from September to May, though lagoon fishing is carried on throughout the year. To exploit the *Tuna* fish resources of the islands, a pilot tuna canning factory was started at Agathi island in 1963. In addition, small canning units have been set up on Kavarathi, Agathi and Minicoy. A new tuna fish canning factory on commercial lines has also been established in Minicoy, with a production capacity of 5,000 cans a day. This factory, having cold storage and an ice plant cost about Rs. 350,000. Almost 35% of the total fish landing is done by mechanised boats which now number 51. There is a boat-building yard at Kavarathi island.

Apart from the traditional industries, a hosiery factory has been started in Kalpeni and in the capital island of Kavarathi. One co-operative handloom weaving factory has been set up at Chetlat to manufacture items like bedsheets and *lungis* to meet local demands. A weaving centre was also started at Agathi (1960-61). A plant for producing curled fibre from coconut husks has been set up in Androth island. A model poultry farm has been set up in Kavarathi with poultry units in other islands.

Transport and Communication : These islands remained almost isolated from the mainland for nearly six centuries, the only communication being during the non-monsoon months by means of country craft. The traditional mode of transport between the islands and the mainland is by sailing vessels. These are mainly carriers of cargo. For passenger traffic, the people depend

on motor vessels, plying between islands. The Laccadive Administration now has its own ship, M₁ V. Laccadive which has a capacity to carry 40 passengers and 100 tons of cargo.

As the average area of island is less than $1\frac{1}{2}$ km², there is practically no internal surface transport. Small tractors and handdrawn trolleys are used to transport goods in some islands. Bicycles are the main mode of conveyance in all islands. For inter-island communication, small topsail schooners using both oars and sail and sometimes odams or small boats are used.

Bay Islands

Bay islands comprise Andaman and Nicobar groups of islands and are strewn like beads in the blue waters of the Bay of Bengal. Administratively, they are a Union Territory governed by a chief commissioner. Port Blair is the administrative headquarters of the Andaman and Nicobar district, divided into different sub-divisions (Fig. 29.2). These islands are served by steamer service from Calcutta and Madras and by air from Calcutta. The northernmost tip of Andaman is 560 nautical miles from the mouth of the Hooghly and the southern tip of the southernmost island of the Great Nicobar is only 90 nautical miles from Sumatra. Physically these islands are young fold mountains which are a continuation of the Arakan yoma. Structurally the Islands constitute two

major groups separated by a deep sea named as Ten Degree Channel. Culturally also these islands are quite different from each other.

The Andaman Islands

The Andaman group of islands comprises of 204 islands, the major among them being the Great and the Little Andamans. The Greats Andamans are physically divided by narrow creeks into the North Andaman, Middle Andaman, South Andaman, Baratang island and the Rutland island. The Little Andaman is about 46 km south of the Rutland island. These islands together spread over an area of 6,682.2 km² and look like a succession of dome-shaped forest-covered hill ranges running parallel to each other from north to south. Saddle peak is the highest (750 m). A noteworthy feature of the drainage system of these islands is that the perennial rivers are few and the water supply constitutes a permanent problem. The rock formations belong to the Mesozoic, Tertiary and Quaternary eras. The predominant rocks in the North Andaman are the conglomerates and in the Middle and South Andaman, the sandstones. Most of the hill ranges and peaks have been formed from the serpentine rocks. In addition, there are Recent and sub-Recent deposits on the raised beaches that fringe the coast. Changes in the sea level have been noted by different geologists. These

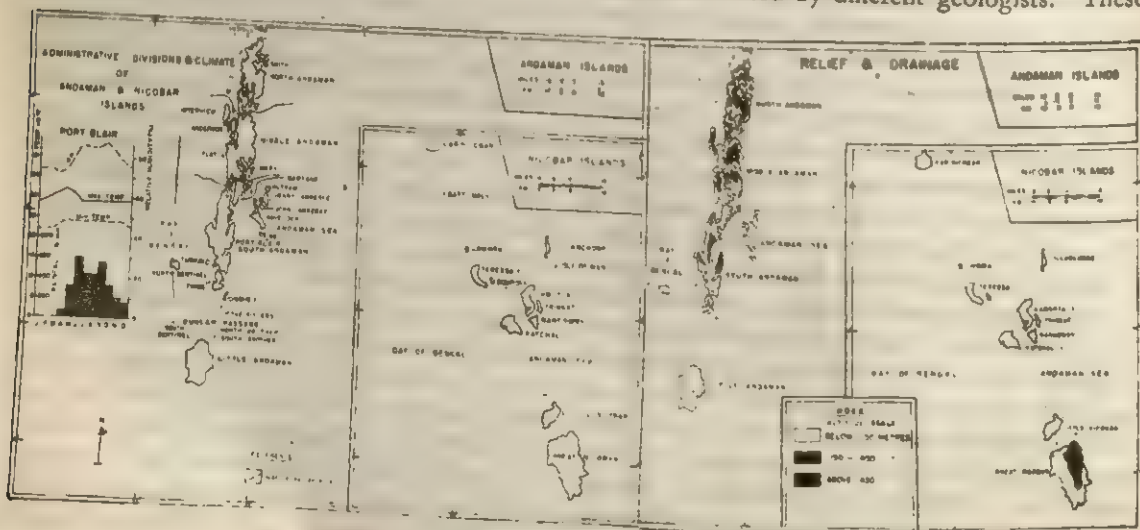


Fig. 29.2

islands lie within the earthquake belt of the south-east Asia. So far only one earthquake of considerable intensity has been recorded in Andaman (31st December, 1881). There are two volcanic islands, namely Barren and Narcondam situated within 80 km east of the Andamans.

The Bay islands as they lie south of the Tropic of Cancer and are surrounded by the warm seas enjoy a warm and humid climate. The rainfall continues throughout the year except for a short period of dry spell (February to April). The average annual rainfall is above 200 cm. The mean maximum temperature recorded at Port Blair is 29.7°C and the mean minimum is 23.7°C.¹⁰

The natural vegetation is evergreen forest which covers 78% of the total area. Of the total area under forest 86% is reserved, 8% is under tribal reserve, 1% is protected and 5% is unclassified.¹¹ The regional distribution of the natural vegetation may be divided into four categories. Along the sea coast are the mangrove forests. Low level evergreen moist and semi-deciduous forests covers the area from above the high tide water level to about 300 m. High level evergreen forests are upto an altitude of 600 m. The high hill peaks are covered with scrub forests. The Andaman forests are rich in match wood, plywood, hardwood, ornamental wood, cane, resins and gums. In 1960-61 the revenue from the forests was about Rs. 1.2 million.¹²

The soils are either *in situ* on the hill ranges or deposited in the valleys or along the sea coast as transported soil. Along the sea coast the soil is sandy and contains shingles, old corals etc. It is extremely porous. In the valleys and the lower slopes of hills the soil is clayey loam. On the hills it is stiff clay with dark red loam overlying the micaceous sandstones. It is moist throughout the years.¹³

The wild life in the forest is peculiarly deficient, especially in big mammals and carnivores. Some of the important animals found are wild pigs, sambhar, and other species of deer. These islands are rich in birds, butter-flies and insects etc. The animals, especially the wild pigs are largely hunted for food by the tribals.

The People and Economy

The oldest stock of these islands consists of the aboriginals belonging to Negrito race. After the establishment of Penal Settlement in 1857 by the British, people of different racial stocks were transported to these islands from India and Burma. Their descendants constitute the present day local born population. After Independence, the influx of the refugees from East Bengal and other people from the over populated states of India like Andhra Pradesh, Tamilnadu and Kerala have added new population elements to these islands.

Growth of Population : There has been wide variation in population growth trend since 1881 when the total population was 14,628. It rose to 18,938 in 1901. This rapid growth was due to large influx of penal convicts. A decline of population was first observed during 1911-1921, due to the cessation of the transportation of term convicts in the year 1906 and the complete abolition of the penal settlement in the Andamans in 1921.

During 1921-41 there was a steady growth.¹⁴ In 1923 greater inducements were permitted to the descendants of the convicts. They could thence first live as free settlers in these islands. Villages were established and a free population began to grow in and around Port Blair. As a result, many families from India and Burma came to the Andamans. The 1941-51 decade witnessed decline from 21,316 to 18,961, mainly because of Japanese occupation, during 1942 to 1945 when a large number of people were either killed or died of starvation, disease etc. There was a sudden growth of population, however, during 1951-61 and the population rose to 49,000 (1961). This sudden increase was mainly due to the influx of the refugee settlers and certain economic developments.

Migration : During the penal settlement period, migration to these islands was inflated due to the transportation of convicts, political prisoners and a large number of supervising staff.¹⁵ After the Independence, the migration figures swelled due to temporary migration of labourers from Chotanagpur, Andhra, Tamilnadu and Kerala. Between 1949 to 1951 the Partition enforced the

movement of 1500 displaced families to the Andamans. Since 1951, immigration has become a regular feature and till 1960, 2,993 settlers had migrated there.

In 1901 the tribes represented about 10.5% of the total population, which dwindled to only 0.4% in 1961. They were originally divided into several territorial groups and being hostile to each other and engaged in internecine conflicts, they dwindled in strength. At present only four groups survive living in different areas.¹⁶ The Andamanese and the Jarwa live in the main island group, while the Onge are found in the Little Andaman and the Sentinalese on the Sentinel island (Fig. 29.3). The Jarwas and the sentinalese

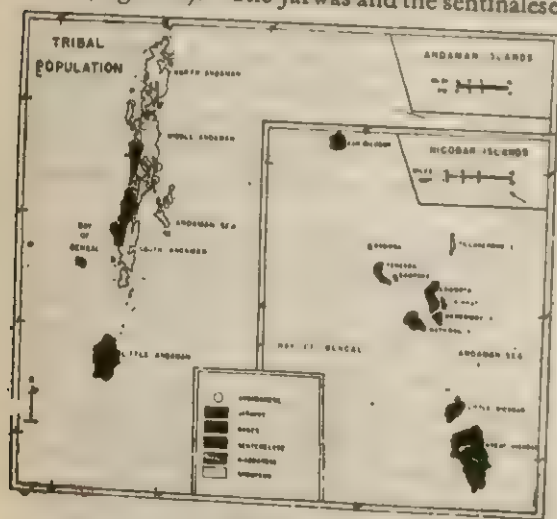


Fig. 29.3

form the hard core of the tribes and are not amiable to the outsiders. The Andamanese and Onges are quite amenable.

The Karens migrated from Burma in 1925 for working in the forests as labourers. They have now combined agriculture with forestry and specialize in wet rice farming. Numbering about 500, they live in the Middle Andaman island. They are Christians by religion and have built a beautiful church and a school on this island.

The Mappillas were brought to the Andamans as prisoners of the Mappilla (Mopla) rebellion of 1921 in Malabar against the British rule. They are now good cultivators and fishermen.

The Burmese were brought as convicts from

Burma in 1907-8 and again in 1923. They have settled in the Port Blair town and in the villages in South Andaman island, and are now good cultivators, forest workers and own a few shops in the town. They are Buddhists and have constructed beautiful Pongychang (Buddhist temple) in South Andaman. Some of their villages have names like Mamyo, Wrightmyo and Templemyo.

The Bhandus were brought as convicts from Uttar Pradesh in 1928 and settled in a village named Ferrarganj in South Andaman. They are now good agriculturists.

Distribution of Population : The distribution of general population in Andaman islands is highly uneven. The population is mainly concentrated along the east coast, primarily due to the existence of a number of safe harbours and perennial streams. There are five areas of fairly large agglomerations. On the South Andaman island the population is concentrated in the Port Blair town and in the villages along some of the valleys. These are the oldest settled parts of the islands. The second concentration is along the Yoljig and Rangat bays towards the south-eastern parts of the Middle Andaman, colonization of which began in 1953 mostly by the displaced persons of East Bengal. The north-eastern and south-eastern parts of the N. Andamans are also densely settled, mainly since 1956 by displaced persons from East Bengal. The density of population varies from 5 to 8 in different islands.

Agriculture being the primary occupation, engages 24.5% of the total population in North Andamans, 13.4% in the Middle and 6.7 in the South Andamans.¹⁷ The comparatively lower figure in South Andamans is due to the urban influence of Port Blair.

About 49% of the population of the Bay Islands constitutes the working force. Of the total workers 21.8% are engaged in agriculture, 23.4% in mining, plantation etc., 14.9% in household industry, 17.5% in construction and 13.8% in services. In contrast, about 82.8% of the workers in the Arabian Sea Islands are engaged in household industries, followed by 4.7% in mining, plantation etc., 3% in manufacturing and only 1.1% in agriculture.

Port Blair—an island town, is the only town in the Andaman and Nicobar islands, situated along the east coast of the South Andaman island with a natural harbour (Fig. 29.4). The site was first discovered by Captain Archibald Blair in 1789 with the aim of establishing a colony to put down the piratical acts and murderous assaults on the ship-wrecked crew by the hostile tribes. He brought about 200 free settlers comprising carpenters, iron-smiths, sawyers, brick and pot makers, bakers, gardeners, fishermen, tailors, *hawaldars* and private sepoy from various parts of India and Burma with a provision of six months' ration.¹⁸ The first colony was established on the Chatham island inside the harbour. The land around the harbour was under dense forest inhabited by hostile tribes. Gradually forests were

cleared around the harbour and a road was cut from Phoenix Bay of Navy Bay which is now an important road of the town. In 1792, the colony was removed to another harbour along the east coast of the North Andaman island and was named there as Port Cornwallis. Another batch of settlers comprising of both the free men and the convicts (numbering about 270) was sent to these islands. In 1796, the colony at Port Cornwallis was abandoned due to sickness and the rising death rate among the settlers. The settlement at that time consisted of 820 persons who were sent back to Penang and Bengal. From 1796 to 1857, the islands were allowed to lapse again to their original wild condition. In 1857, a Commission appointed by the British Government visited the islands for the purpose of selecting a site for the

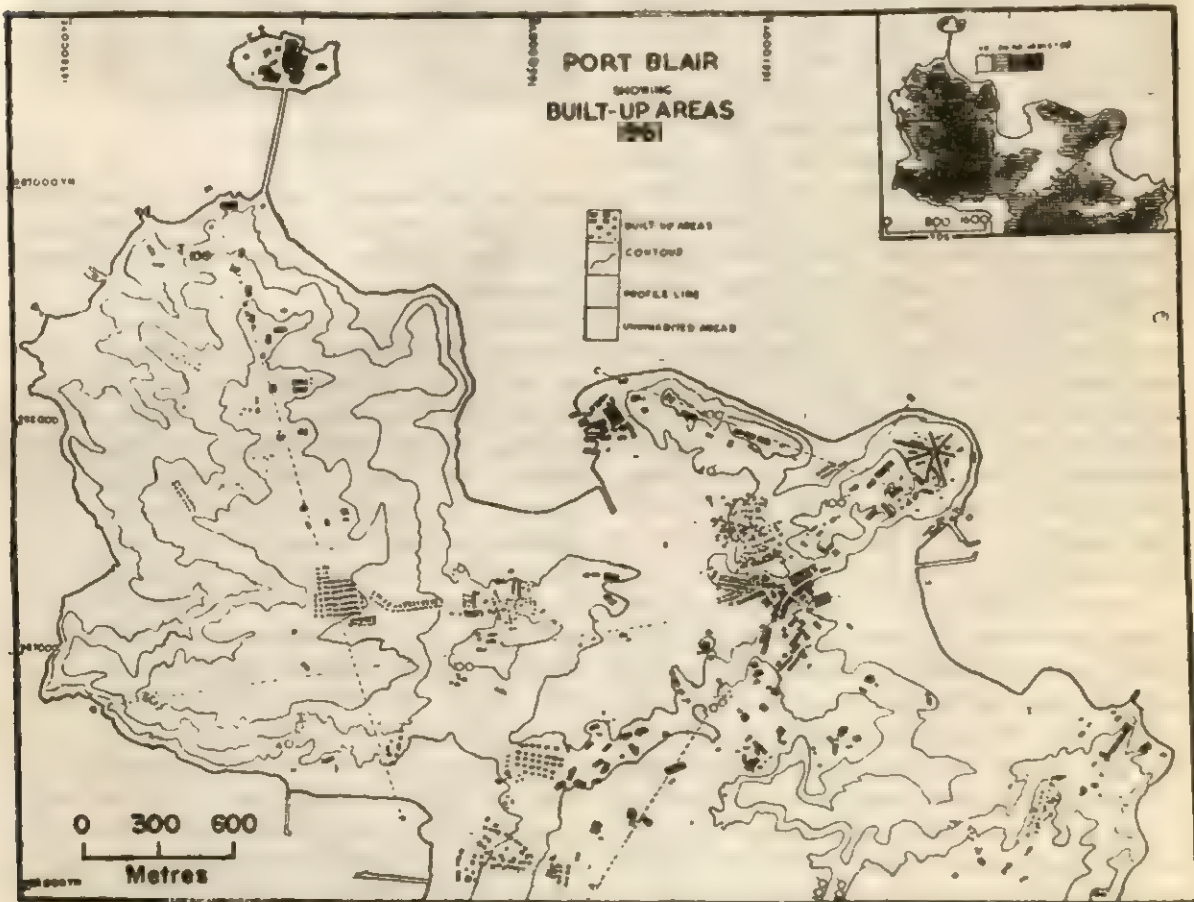


Fig. 29.4

Penal settlement. The Commission selected the same site which Captain Blair had selected earlier. It was named as Port Blair. On 4th March, 1858, J. P. Walker, Jail Superintendent arrived at Port Blair with four European officers and 733 convicts. They cleared Chatham-Ross island and Haddo and Atlanta points. Convicts' barracks were established in the cleared areas. This seems to be the beginning of the present day Port Blair town.

Another landmark in the evolution of the town was the construction of the Cellular Jail—the Bastille of India—which was started in 1890 and completed in 1905. The jail forms the nucleus of the present town, with dense clustering of habitations around. During the later part of the 18th century Port Blair grew as a Penal colony and also a free settlement consisting mainly of ex-convicts and their descendants who settled in Aberdeen, Middle Point, Junglee Ghat, South Point, Haddo and Delanipur which are now wards of the town.

During its Japanese occupation in World War II the island became a naval base and suffered much destruction in men and resources. However, the paralysed town of Port Blair has been infused with fresh blood after Independence and is the capital of the islands which have now assumed an honourable pioneering character. Several educational and cultural institutions have been established. It has now electricity and water supply system also (Fig. 29.5). The Municipal board was established in 1958 for the general improvement of the town. The cinema house, tourist home, hospital and a radio station have been added. In 1951 it had a total population of 8,014 which rose to 14,099 in 1961.

Business, industrial and residential areas are distinguishable in the urban landscape. The core of the business activity conforms more or less with the heart of the town. Quite near the Cellular Jail, the nucleus, a parade of shops has emerged and is known as the Aberdeen Bazar. The oldest residential houses, mostly made of timber and tin on raised platforms, are found around the Aberdeen Bazar. In contrast to the old houses, other houses have emerged elsewhere on the government and private initiative. The

houses made by the government agencies mostly after 1960 are of two types, family quarters and bachelor's quarters. The former contain a verandah and two to three bed rooms, while the latter is a big block of containing 5-6 rooms arranged

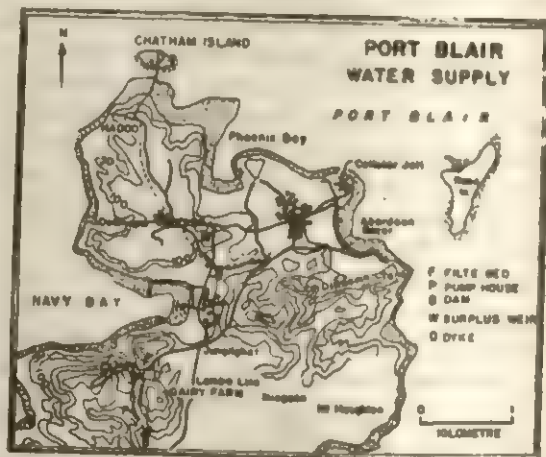


Fig. 29.5

in a row with common kitchen, latrine and bathroom. New residential quarters have sprung up in Haddo, Shadipur, Phoenix Bay and South Point wards.

There are a few large scale industries based on forest and sea products.¹⁹ Notable among them are the Govt. Saw Mills at Chatham, WIMCO Match factory at Haddo, and the Marine Engineering, Building and Repairing workshop at Phoenix Bay, each employing more than 100 workers. The Govt. Saw Mills as the biggest unit employs 1,153 persons, drawing labour from Port Blair and the outlying villages like Bamboo flat, Hope town etc. The WIMCO Match Factory, established in 1930, produces match splints for shipment to the mainland match factories. The total export of match splints from Port Blair during 1959 was 2,637 tons.

Port Blair maintains two cargo-cum-passenger ships to Calcutta and Madras. The chief items of export to the mainland are timber, match splints, shells, coconuts, copra, rubber and betelnuts, while the imports consist of machinery and stores, petroleum and petroleum products,

piecegoods, cereals, cement and building materials.

Villages : The Andaman villages are grouped as old and new, the former belonging to the period of Penal Settlement and located in the South Andamans. The latter have sprung up in the process of colonization after Independence, mostly in the Middle and North Andamans.

Dollyganj (1961 pop. 197) is a typical old village, 5 km from Port Blair and linked with it by a metalled road. The population is mostly local born. The village is situated in a valley drained by a *nala* and the land around is quite level. The houses are made of timber and tin. Drinking water is collected from the *nala* for which the residents have to go to a long distance during the dry season. Paddy is the predominant crop covering most of the cultivated land, ploughed by buffaloes. Uneconomic land holding is a notable feature of the old villages in Andamans. In Dollyganj about half the land holdings are less than 2 acres and only 10% more than 3 acres. The predominance of non-agricultural occupations is due to the urban influence of Port Blair and the single crop economy of wet rice.

Nayagarh (1961 pop. 215) is a newly colonized village of Baratang island in Middle Andamans. Each household is allotted 5 acres of level land for wet rice cultivation and 5 acres of uncleared hilly land. The houses, made of bamboo and leaves, are situated amidst the paddy land. Unlike Dollyganj the primary occupation of the village is agriculture.

Agricultural Economy : Agriculture in the Andamans is severely handicapped by its unfavourable topography. Forest-clad hill ranges extending throughout the island restrict the agricultural land. The cultivated percentage has increased from 1.2% of the total land in 1960 to over 4% in 1964-65.

According to the land use figures for 1959-60, the total area surveyed in Andaman islands was 36,769 hectares, forming about 0.16% of the total area. Out of the total surveyed area, 19% is not available for cultivation, 17% under other uncultivated land excluding fallow lands, 1.97% fallow land, while the total cropped area comes to

about 23.7%. Out of this only 4% is sown more than once. More than 50% of the total cropped area is given to the cultivation of paddy, maize, millets and pulses. Coconut plantations are second to food crops in acreage. Fruits, arecanuts, tapioca, chillies and turmeric together occupy the third place. The area under paddy by the end of the Second Plan was 16,827 acres, producing about 8,700 tons. About 3,000 tons of food grains are annually imported to meet the deficit. Again, 2,250 tons of paddy are required to feed the elephants, poultry etc.

Transport and Communication : The transport system in Andaman Islands comprises of a sparse road network (543 km in 1964-65), mostly confined to South Andamans (Fig. 29.6), while the inter-island steamer service connects the town of Port Blair with North, Middle, South and Little Andamans.²⁰ A couple of bigger size vessels connect Port Blair with the Nicobar group of islands. There are 13 harbours, 6 of which are creek ports catering to the needs of the settlers, 6 are logging ports and only Port Blair figures in the Andaman trade. State buses ply only in Port Blair town and connect it with the surrounding villages within a radius of 40 km. Of the total road kilometerage 53% are black topped.

There are 13 post offices in Andaman islands. Police radio has been recently introduced due to the strategic location of the islands as also for protecting the people from untoward incidents like epidemics, snake bites and accidents.

The Nicobar Islands

Historical Background : The Nicobarese are certainly an ancient race of people identified as *Loenje* (naked people) of L T Sing (A. D. 672) or the *Lankabhalu* of the Arab mariners (A. D. 851) or Marco Polo's *Nemveram*. There is definite historical evidence of the Second Rajendra Chola's conquest of Car Nicobar (*Kar Dwipa*) and Great Nicobar (*N-g Dwipa*).²¹ Even today a little stream in Great Nicobar is called the *Ganga* and a village in Terassa is known as *Lakshmi* which is suggestive of Hindu influence in the past.

The Nicobar islands have been visited by foreign missionaries mostly during the eighteenth century.



Fig. 29.6

particularly the Danish who arrived here in 1778 and worked for three years. The Moravians attempted to colonize these islands during 1790 and 1804. The British took possession of these islands in 1869 and a Penal Settlement, under the control of the Andamans, was established but later in 1888 it was withdrawn. The islands remained under the possession of the Japanese during 1942-45.

Ethnographically the Nicobarese belong to the Mongoloid stock and are the only aboriginals who continue to sustain their vigour and vitality and can be considered as a living race. Like the Andamanese, nothing definite can be said about their origin. A theory that they may have come to these islands from some part of South-East Asia has been advanced. According to their own legend, they are the descendants of an exiled Burmese prince; this lends support to the above theory. For centuries they have remained isolated

from other cultural influences and have developed a distinct way of life, language and social and economic organisation of their own.

The Car Nicobarese have embraced Christianity and are quite progressive but most of those residing in the Central and Southern group of islands are still primitive and believe in witch-craft and devil worship. However, the entire population of the Nicobar islands may be classed into two groups, the Nicobarese and the Shompens. The total population of the islands according to 1961 census was 13,903 out of which only 71 were reported as Shompens.

Physical Setting : The 10° Channel with a uniform depth of 400 fathoms and an approximate width of about 125 km separates the Andamans from the Nicobars. The existence of this fracture indicates that the two groups are the result of two distinct geological events. There is distinct difference in their physiography also. Some of the islands in the Nicobars like Chowra and Pulo Milo and the littoral fringe of Car Nicobar are essentially coral, while Katchall, Nancowry and Great Nicobar are hilly as are the Andamans. Out of 18 islands in the Nicobar Group 11 are inhabited—Car Nicobar, Chowra, Teressa, Bom-poka, Camorta, Trinkat, Nancowry, Katchall, Little Nicobar (Pulo Milo), Great Nicobar and Kondul. The remaining seven—Batti Malav, Tilangchong, Meroe, Trak, Trais, Menchal and Kabra are uninhabited.

On the basis of some geological work it is agreed that the sandstones and shales of the southern islands are akin to the Port Blair series of the Andamans in which poor lignite coal is embedded. Some of the islands in the North Chowra, Car Nicobar and Great Nicobar in the south are fringed with corals.

The climate is typically hot and humid (Fig. 29.1). The impact of both the monsoons is felt. Spell of dry weather prevails during February to April and in October. The prevailing climate has induced malaria in many parts.

There is considerable difference in the flora too. *Padauk* and *Gurjon*, the pride of Andaman forests, are conspicuous by their absence here. Some of the species are quite valuable for commer-

cial purposes such as the soft timber used for the match wood and coconuts which cover fairly large areas in these islands.

Monkeys are found in great number and are a menace to the coconut groves. Wild pigs found in the forest are hunted by the people. Pythons and a variety of other snakes are also found.

The People and the Economy

The Nicobarese are spread over the 11 inhabited islands of the group (Fig. 29.3). Unlike the Andamanese, their number has increased from 11,712 in 1951 to 13,703 in 1961. The Car Nicobar with a population of 10,000 is almost overpopulated.

The Nicobarese are largely dependent on coconut palm which thrives very well in the sandy belt along the sea coast. It is not only a source of food and drink but also of copra, the main item of trade. They also grow arecanuts and export betel nuts in good quantities. The copra and betel nuts are the only exchange materials. They also raise bananas, yams, papaya and other fruits and vegetables for local consumption. One special item of their food is the large globular fruit of *pandanus*. They chew a lot of betel nuts and leaves, smoke tobacco and drink toddy. Crop culture is of little significance.

The traditional dress of the people is thin loin cloth for the men and grass skirts for the women. Now the women wear blouses and skirts in the Burmese fashion, while the men have adopted beach shorts of colourful material as their normal dress.

The Nicobarese live in dome-shaped as well as rectangular huts with sloping roof. The huts are well raised above the ground on stilts and are entirely made of local materials such as timber, bamboos, cane and grass. These are well adapted to the climate. Their villages consist of clusters of huts with an open space in the centre and are kept very clean. The villages are situated near the shores of the islands as it is convenient for communication by sea. Every village has its own community house and common birth and death houses on the shore. The Nicobarese rear pigs whose number is the measure of their wealth. They use canoes for fishing. Their

handicrafts are mats of dried coconut and *pandanus* leaves, cane baskets, toy canoe models and coconut shell containers. In Chowra island earthen pots of fairly good quality are made. In Chowra, Kondul, Nancowry, Car Nicobar and Great Nicobar, good canoes are made and exchanged for the Chowra pots.

There is a typical joint family system in the Nicobarese society. The head of the family is much respected and obeyed. All the heads of the families together elect a headman of the village, and all the headmen constitute the village council which looks after the village matters. They bury the dead bodies.

Shompens live only in the Great Nicobar island. It was for long believed that the interior of Great Nicobar was inhabited by Negritos akin to the wild tribes of the Andaman Islands. In fact, the Shompens belong to the same stock as the other inhabitants of these islands and later arrivals pushed them towards the interior, which led to subsequent differentiation among the islanders. Shompens appear to have a remote admixture of blood; they are a shade darker and are also slightly smaller in stature than the Nicobarese. Their hairs are in all the grades between curly and straight and their appearance also varies greatly from that of the Nicobarese.

Their number as estimated by Boden Kloss in 1905 was between 300 to 400. Later a large number are believed to have been wiped out by influenza and later by poliomyelitis. In 1960, Shri Chengappa counted 48 Shompens and estimated their number at 100. The 1961 census gives their total number as 71. According to recent estimates the Shompen population is about 100.

The Shompens are divided into two groups. The smaller group has been living near the coast and a few km up the big rivers like Jubilee, Dogmar, Alexandra and Galathea. They have been friendly with the Nicobarese living in the coastal villages. They barter their honey, cane, arecanuts etc. for cloth, tobacco leaves, iron implements etc. The inhabitants of the interior are generally hostile.

The Shompens live in rudimentary huts made of local materials on piles. The huts are arranged in a circle with an open space in the centre and are

located by the side of sweet water channels. They make cooking vessels from the bark of trees. In the past they used to make bark cloth but now they get cloth from the Nicobarese. The men wear a short *Langoti* (loin cloth). The women wear *Langi* and the upper part of the body is naked.

The Shompens live largely by hunting, fishing and gathering. Their food comprises of pandanus paste, grilled fish or boiled meat, mostly without salt. They make fire by rubbing particular type of dry twigs. They live in small groups with blood relations and are polygamous.

The Regions

The Indian Islands are divided into two first order regions owing to their location in the two bordering seas : the Arabian Sea Islands and the Bay Islands. There are distinct variations in the physical environment including geological structure, drainage, resource base and the human response to these, as well as the ethnological groupings of population; and thus it is possible to distinguish five second order and six third order regions according to the following scheme, though there are considerable variations sometimes from island to island which may lead to the recognition of fourth and fifth order regions (Fig. 29.7). No attempt has been made to demarcate such lower order units for want of adequate information.

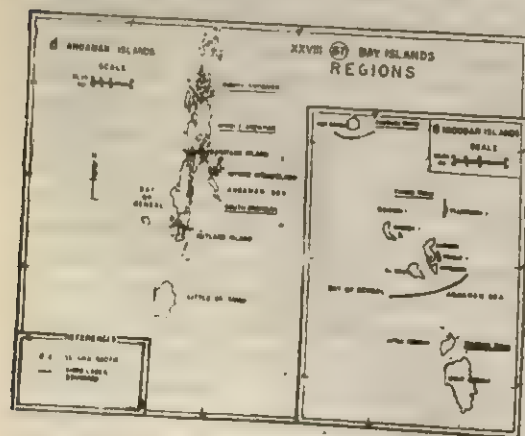


Fig. 29.7

Regional Scheme

66. *Arabian Sea Islands*
 - (a) Amindivi Islands
 - (b) Laccadive Islands
 - (c) Minicoy Islands
67. *Bay Islands*
 - (d) Andaman Islands
 - (i) North Andamans
 - (ii) Middle Andamans
 - (iii) South Andamans
 - (e) Nicobar Islands
 - (i) Northern Group
 - (ii) Central Group
 - (iii) Southern Group

The *Arabian Sea Islands* have three main groups—(a) the Amindivi Islands, (b) Laccadive Islands and (c) Minicoy Islands; of these three second order regions, Amindivi Islands forming the northernmost region comprise the inhabited islands of Chetlat, Kitten, Kadamath, Amini and Bitra and cover an area of 8.3 km² with 7,935 inhabitants. Its uninhabited area is constituted by isolated reefs. Kadamath is the largest (3.03 km²) of the group and Bitra (0.13 km²), the smallest. Amini is the second largest of the group but contains the largest population (3,531). The Laccadive Islands enjoy the central position south of the Amindivi comprising Androth, Kavarathi, Agathi and Kalpeni. The headquarters of the Arabian Sea Islands lies in the Kavarathi.

The Minicoy, enjoying the southernmost location is the largest (4.53 km²) of all the islands and is also most advanced covering about 10% of the area of the inhabited islands.

The *Bay Islands* have two distinct regions of second order : The Andaman Islands and the Nicobar Islands separated by 10° Channel. The Andaman Islands may be divided into 3 third order regions as North Andamans, Middle Andamans and South Andamans.

The *North Andamans* consist of 50 islands of different shapes and sizes. The principal island is named as North Andaman having an area of 13,800 km² and a population of 7,099 (1961). It is the third in area in the Andamans group. About

15% of the total population of the islands is concentrated here. The colonization of this island is quite recent as compared to the Middle and the South Andamans. The majority of the settlers are from East Bengal and the rest are from Kerala. The population resides in 37 villages established in the cleared valleys, excepting 141 persons who live in Bush Police Camps. A single 9 km Jeepable road connects Ariel Bay with Diglipur, the administrative headquarters. Other colonized areas are connected by fair-weather road with Diglipur. Less than 2% of the area is cultivated (1960). Paddy occupies 95% of the total cropped area; 3.5% land is under coconut plantations and 1.75% under arecanuts, fruits, chillies, turmeric and tapoica. The settlements are highly fragmented and individual homesteads occur amidst the cultivated fields. The houses are made of bamboo, cane and leaves and sometimes 3 to 4 huts are grouped around a little courtyard with a tank for bathing and cleaning purposes.

The *East Coast region* of North Andamans is entirely settled by persons from East Bengal. Important villages are Durgapur, Sheopur, Kalipur, and Ramnagar. The *Saddle Hill region* is a prominent geomorphic feature of these islands. Its length is 29 km and width varies from 5-8 km. The West Coast region of N. Andamans is almost uninhabited mainly due to non-perennial streams. A few villages have come up near available water-points. Diglipur township is developing as a result of administrative functions in the *Central Region*. The southern part of the N. Andamans is distinct due to the penetration of inlets of Kalra, Parangra etc.

The *Middle Andamans*, covering an area of 1760.78 km² occupy second place in area and have 22.6% of the total population of the islands. This group comprises 27 islands of which only four, Middle Andaman, Interview, Lond and Porlob islands are settled. Structurally the group shows a transitional character between the predominantly conglomerate area of N. Andamans and sandstone-shale area of South Andamans. Culturally also, it exhibits a transitional character between the predominantly agricultural N. Andamans and agro-industrial South Andamans. Only 0.7%

of the total area of Middle Andamans is cultivated (1960). Paddy alone occupies 87% of the total cropped area, the remaining being under coconuts, fruits and miscellaneous crops. The total population of the islands is 11,082 (1961). About 17% of the population lives in the forest and Bush Police camps. The rest reside in villages. The old villages are near Mayabundar, mainly settled by the Karens of Burma. The new villages are settled by the East Bengal people.

In the *Northern part* of the Middle Andamans there is Mayabunder township containing a saw mill. The township with a population of about 1,000 persons has some government offices, wireless station etc. It also acts as a port for the Middle Andamans. Lack of drinking water and malaria are the main problems. In the *Karen region*, the Burmese live in a chain of isolated villages along the Mayabunder-Tugapur road. Important villages are Webi, Base Camp, Rest Camp etc. Cultivation, fishing and hunting are the main occupations. *Betapur region*, drained by the Betapur river is mainly peopled by East Bengalis and Keralites. *Rangat Valley* region is distinct due to Rangat township (747 in 1961) whose growth is due to the administrative functions.

Long island (13.2 km²; pop. 562) has developed as a logging centre and as a junction for the inter-island steamer services. It has also a government boat building yard. All these islands constitute the *Eastern section* of the Middle Andamans. Porlob, Yoljig, Tugapur and Lowis and Interview islands are important regions in the *Western part* partially settled by persons from East Bengal. Interview island (pop. 283) is important for lumbering, exporting the timber to Mayabunder saw mill. The western hill ranges of Middle Andamans are the hunting ground for the Jarwa tribes. The Jarwa region extends to the Western Coast of South Andamans also. It is hilly and thickly forested. Jarwas (pop. 50) belong to Negrito race and are short statured with woolly hair. They are migratory and make temporary shelters. Many attempts were made by the Andaman administration to establish contact with them but failed due to their hostile attitude. The Bush

Police camps have been established to check Jarwa raids on the villages.

South Andamans (area 2,373.63 km²), both physically and culturally have a distinct regional personality. Altogether this island group comprises 42 islands, the main being the South Andaman (1,347.9 km²). The serpentine rocks have resisted weathering and have formed prominent peaks. About 68.8% of the total population of Andaman lives in South Andamans. Port Blair, the chief town is located on the east coast of these islands. In 1960 the total cropped area in South Andamans was 12,195 acres. Out of this paddy alone occupied more than 50%; the rest was devoted to coconut plantations, rubber, areca-nuts and fruits. The settlement of South Andaman islands dates back to more than one hundred years. The villages are fairly big in which timber and tin houses are huddled together on elevated land overlooking the valleys.

The sub-regional contrasts are more striking. The villages are confined to the longitudinal valleys. In the *Dhanikhari valley* there are villages settled by the local born people. In the *Mithakhari Valley* there are villages settled by Bhandus. The Western slopes of the Harriet range are famous for coffee cultivation covering 4,000 acres. In the *Shoal Bay region* isolated hutments are found in the small clearings along the streams. The *Burma Nala-China Tapu region* of South Andamans is famous for coconut plantations.

In the *Dhanikhari valley* in the proximity of Port Blair town most of the persons are engaged in non-agricultural activities. *Baratang Island* (297.8 km²; pop. 720) is detached from South Andamans by straits. Eleven villages were established after 1949 and are largely settled by people from Ranchi (Bihar). The main occupations are forestry and cultivation. *Rutland Island* is covered by thick forest and is uninhabited. *Little Andaman* (699 km²) is situated 50 km south of the Rutland island. It is connected with Port Blair by a fortnightly steamer service. This island is the home of the Onges, a Negrito tribe. They are among the oldest tribes of the world and live still by hunting and gathering. Their estimated number in 1951 was 150 which de-

creased to 132 by 1963-64. They live in large communal thatched huts, located along the sea. Onges seldom wear any clothing.

The *Nicobar Islands* are divided into three third order regions based on their location : *The Northern Group*, the *Central Group* and the *Southern Group*. The Northern group consists of the Car Nicobar which is famous for animal husbandry and in proportion to the area the density of pigs is the highest in the country. The Central Group comprises a number of islands, Camorta, Katchal and Terassa being large and inhabited ones. Based on cultural practices and dialects the Central Group may be divided into (1) Terassa, (2) Chowra, (3) Nancowry, Kamorta, Katchal and Trinket. The Southern Group consists of two large islands among several smaller ones, the Great Nicobar and the Little Nicobar. In Great Nicobar, the Nicobaris are found only along the coast, while the interior is inhabited by Shompens, one group of which maintains friendly relationship with the coastal Nicobaris.

Problems and Prospects

The development of the Indian Islands is intimately related with their strategic location in the marine world of India. The Bay Islands, in particular, are extensive enough to be developed as strong naval base as also centre of naval and associated engineering industries. Deep sea fishing can be launched from these locations and related industries set up here to diversify and enrich their economy. In any programme of development of these islands, improvement in their linkages with the mainland through more frequent steamer services is the *sine qua non*. The fortnightly services are already proving inadequate. The efficiency of the distribution channels of goods and services from Port Blair to the different islands also needs improvement and strengthening. At present, small steamers require about a week for a round trip of the islands.

The Arabian Sea Islands differ in scope and resources from the Bay Islands. In the former, the agricultural and forest resources are negligible, though population density is extremely high. In these islands non-agricultural activities can be

developed, mostly based on plantation of coconuts and fisheries; the lagoon fisheries can be extended to deep sea fisheries by providing trawlers and adequate training. As tribal problem is negligible and the islands are much nearer to the mainland the region can be modernized through adequate development of thermal power and other resources. As during the vigorous monsoon season these are almost isolated, any programme of development has to be adjusted to this. In the Bay Islands, both agriculture in-

cluding plantation of coffee and coconuts and forestry offer ample scope for augmenting and diversifying economic development. Tourism could be encouraged by improving the beaches and other infrastructures including subsidized transport from the mainland. A continuous attempt has to be made to bring the tribal people in the mainstream of development. Water scarcity presents a challenge to the development programmes including the process of colonization of the areas in this insular realm.

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APPENDIX 'A'

S.No.	Meso Regions	Area Km ²	Population (Millions)	Density Km ²	Urban Popu- lation	Working Population
					"	"
I	Rajasthan Plain	197,747	6.47	33	20	about 42
II	Punjab Plain	95,714	21.41	224	29.2	—
III	Upper Ganga Plain	149,029	45.10	300	16.5	36.5
IV	Middle Ganga Plain	144,409	55.95	384	7.22	40.0
V	Lower Ganga Plain	80,968	33.50	414	25.0	32.1
VI	Assam Valley	56,579	9.18	162	7.4	43.3
VII	Kashmir Region	222,800	4.40	20	16.7	—
VIII	Himachal Region	56,019	2.81	50	6.3	55.2
IX	U.P. Himalaya	46,485	2.70	58	10.5	61.4
X	Eastern Himalaya	122,802	1.80	14	4.5	—
XI	Purvanchal Rigion	94,800	4.10	43	—	—
XII	Udaipur-Gwalior Region	167,872	16.10	90	16.1	45.68
XIII	Malwa Region	150,000	12.10	81	20.0	50.0
XIV	Bundelkhand Region	54,560	5.30	100	11.0	46.6
XV	Vindhyanchal-Baghel- khand Region	140,172	9.86	70	10.0	53.0
XVI	Chotanagpur Region	86,239	12.96	150	—	—
XVII	Meghalaya-Mikir Region	35,291	1.00	28	12.0	3.29
XVIII	Maharashtra Region	276,777	30.10	110	20.0	—
XIX	Chhattisgarh Region	72,950	6.95	96	—	—
XX	Orissa Highlands	77,000	7.00	90	6.0	—
		(approx.)	(approx.)	(approx.)		
XXI	Dandakaranya	89,078	4.20	46	15.0	—
XXII	Karnataka Plateau	183,340	23.00	126	22.46	46.7
XXIII	Andhra Plateau	204,882	22.93	102	17.2	52.0
XXIV	Tamilnadu Uplands and South Sahyadri	74,254	15.70	212	20.50	47.1
XXV	Gujarat Region	179,320	19.80	110	26.0	40.0
XXVI	West Coastal Region	64,284	25.10	394	31.5	37.4
XXVII	East Coastal Plains	102,882	35.18	342	—	—
XXVIII	The Indian Islands	8,436	0.09	14	—	—

APPENDIX 'B'

GLOSSARY OF LOCAL TERMS

A

Abadi : Settlement
Adhipati : King
Adivasis : Primitive tribes
Agar : Oil
Agni : Fire
Ari : Imposing scarp of plateau
Atharas : Men's Club

B

Babil : Loam
Bagar : Eroded Upland
Bahada : Alluvium-filled valleys (Maharashtra)
Baidis : Lowlands (West Bengal)
Balua : Sandy
Balutedari : A system of land distribution
(Maharashtra)

Barani : Unirrigated tracts (Himachal)
Baras : Enclosures
Bardoichila : Thunder storms
Bareja : Inferior grains (Bundelkhand)
Barhais : Carpenters
Baris : Kitchen gardens
Beeds : Pastures (Udaipur-Gwalior)
Berra or Bejhar : Mixed grains
Bhambis : Leather workers (Rajasthan Plain)
Bhat : Soil rich in lime (Saryupar)
Bhoi : A water service-class (Gujarat)
Bhoi : Submontane region of Central Meghalaya
Bhumiyan : Local chief
Bhunga : Individual residence (Gujarat)
Bichpathia : Middle portion
Bogyals : Himalayan pastures
Bund or Bundh : Embankments
Bustees : Hamlets

C

Chaks : Land holdings
Champas : Pastoral Nomads (Himachal)
Changghar : Wooden platform houses
Chappan : Plain (Udaipur-Gwalior)
Chauk : Central market
Chaupal : A public meeting place
Chaurasta : Cross-roads

Chawls : Labourer's colony
Cher : An attendant
Cheris : Hamlets of scheduled castes (Eastern Ghats)
Chhang : A country liquor
Chhani or Bhunda : Summer residences
Chora : A central square in miniature
Chos : Torrential rivulets
Culia : Tank

D

Dal : Pulse
Dalua : A kind of paddy
Dao : A large chopping knife
Darjis : Tailors
Deoghar : The deity room
Desh : Hinterland of a town (Maharashtra)
Desi : Indigenous
Dhamas : Cardinal point religious places
Dharia or Bewar : Jhumming cultivation
(Vindhyanal-Baghelkhand)
Dhia : Upland Plain
Dhobi : Washerman
Dholis : Drummers
Dhomo : Hollow bamboo as container
Dhus : Mound
Diara : Riverine tract
Dih : Mound
Doab : Land between two rivers
Dokas : A type of hut
Dolois : Small rulers
Dons : Lowlands
Duns : Longitudinal valley
Dwigartha Desa : The land between two furrows

G

Gad : Rivers (U.P. Himalaya)
Gadhera : Rivulets (U.P. Himalaya)
Galla-Mandi : Grain market
Gaura : Cattle feed
Gaura : Herdsmen
Ghanchis : Oil pressers (Rajasthan)
Ghanis : Oil presses
Ghar : House

Gharet : Water mill
 Ghats : A bathing place
 Ghotul : A Social System (Abujhmar hills,
 Dandakaranya)

Girwa : Girdle of hills
 Goalas : Milkmen
 Gochara : Pasturelands
 Goind : Fertile land near settlements
 Gojai : Wheat and barley mixed
 Gompa : Person who owns most of village land
 Goradu : Sandy loam soil (Central Gujarat)
 Gurti : Silt
 Gotra : Line of clan genetics
 Gul : An irrigation system (U.P. Himalaya)
 Gullas : Herdsmen (Andhra Pradesh)
 Gyalpo : Raja, King

H

Hanjis : Boatmen (Kashmir)
 Hats : Markets
 Haveli : Fortress type residence
 Hyund : Summer season (Himachal)

J

Jagirdar : Local Chief.
 Jajmani (system) : Rural service class
 Jajmans : Persons related to servicemen
 Jattiyas : Tanners (Rajasthan)
 Jharkhand : Jungle land in Central Nagpur
 Jhils : Lakes
 Jirak : Official
 Jiryat : Dry crop
 Jola : Jowar (Karnataka)

K

Kahars : A rural service class
 Kal Baisakhi : Nor' Westers (Bengal)
 Kaliparaj : Lower strata of people (Gujarat)
 Kallar : Alkaline soil
 Karail : Clayey soil
 Karykars : Agents of Ali Raja
 Kathia : A variety of wheat
 Katil : Land on forest margins
 Katra : Market
 Kayals : Lagoons and Backwaters
 Kere : Huge tank (Karnataka)
 Kharetar : Hay-field (Himachal)

Kel : Milestone marks
 Khels : Residential quarters in villages
 (Purvanchal)

Kher : A thatch grass
 Konda : Monadnock (Andhra Pradesh)
 Kots : Old mound type deserted sites
 Koyas : Traditional land class
 Krishak : Peasant
 Kshettra : Region, Field
 Kudala : Confluence (Kerala)
 Kuhl : Water channel (Himachal)
 Kumhars : Potters
 Kund : A tank

L

Lahri : Small gardens near houses
 Lohars : Blacksmiths
 Loo : Hot winds

M

Mahajanpadas : Large territories (Ancient)
 Mahapatha : Highways
 Mahavatti : Winter rains (Udaipur-Gwalior
 Region)
 Majghar : Central room
 Malguzari : Revenue
 Malla Village : Uphill village
 Mamkfam : Government officers (Indian
 Islands)

Mandalas : Divisions
 Manjha : Land between two rivers
 Margs : Meadowy slopes
 Marua : Small millet
 Marumakhatayam : A female succession
 Morungs : Guard houses (Purvanchal)
 Muafi : A land grant (Punjab)
 Munga : A golden colour silk
 Munjrik : Cultivators
 Murum : Deccan Trap soil

N

Nagli : Small millets (Gujarat)
 Nais : Barbers
 Nalis : Minor water channels
 Nambal : Peat
 Nara : Dry paddy stems
 Nieger : Odourless oil (Dandakaranya)
 Nokna : Daughter
 Nokpante : Bachelor's quarters

O

Osari : A front verandah

P

Palaya : Old market (Tamilnadu)

Palo : Marginal land
 Pan : Betel leaves
 Panchayat : Village assembly
 Panikheti : Wet farming (Assam)
 Para : A hamlet
 Pargana : A small administrative unit
 Pat : High level laterite plateau (Chotanagpur);
 Mulberry silk (Assam)
 Patil : The village headman (Maharashtra)
 Pissia : A variety of wheat (Bundelkhanda)
 Poduchasa : Jhumming (Dandakaranya)
 Pul : Bridge
 Purbia : Eastern (U.P.)
 Pur, Pura or Purwa : Hamlet

R

Rad : Floating garden (Kashmir)
 Raikas : Livestock raisers (Rajasthan)
 Regur : Black Cotton Soil
 Ringan : Menials (U.P. Himalaya)

S

Sabzimandi : Vegetable market
 Sadi : Century
 Sarkanda : A reed
 Sarovar : Big tank
 Sars : Salt lakes (Rajasthan)
 Sekil : Sandy (Kashmir)
 Sialu : Kharif land (Malwa)
 Sikta : Sandy loam
 Sonar : Goldsmith
 Sukhan Kheti : Dry farming
 Surzamin : Ash (Kashmir)

Syiem : Chief or King (Khasi Hills)

T

Taita : Virgin land (Orissa)
 Tal : Depression
 Talaon : Land in the valley bottom
 Talla : Valley bottom
 Taundi : Winter season (Himachal)
 Thanaguddi : Rest House (Dandakaranya)
 Thikanas : Centres of princely states (Udaipur-
 Gwalior)
 Tilas : Mounds
 Tonda : Manual labour
 Tur : A kind of pulse (M.P.)
 Tush : A kind of wool

U

Unhalu : Rabi land (M.P.)
 Upliparaj : Higher strata of people (Gujarat)
 Upaon : Land on hillsides

V

Vadi or Vasti : Temporary dwellings
 (Maharashtra)
 Vandh : Cluster of houses in a village
 (Gujarat)
 Veddas : Cattle enclosures (Gujarat)

W

Wadas : Backyard of a house (Dandakaranya);
 Large village houses (Maharashtra)
 Walra : Shifting cultivation (Udaipur-Gwalior)

Z

Zaid : Summer crop

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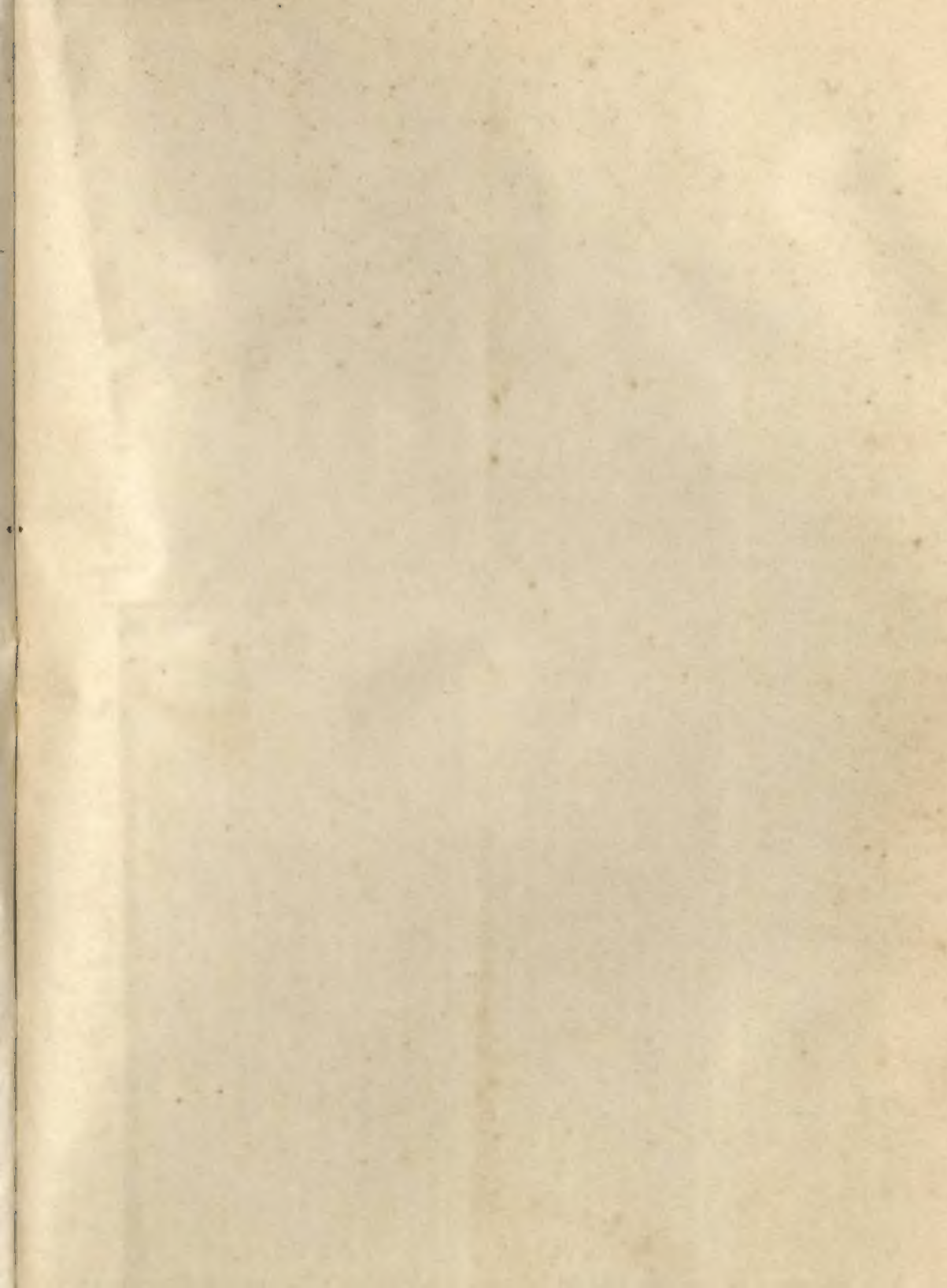
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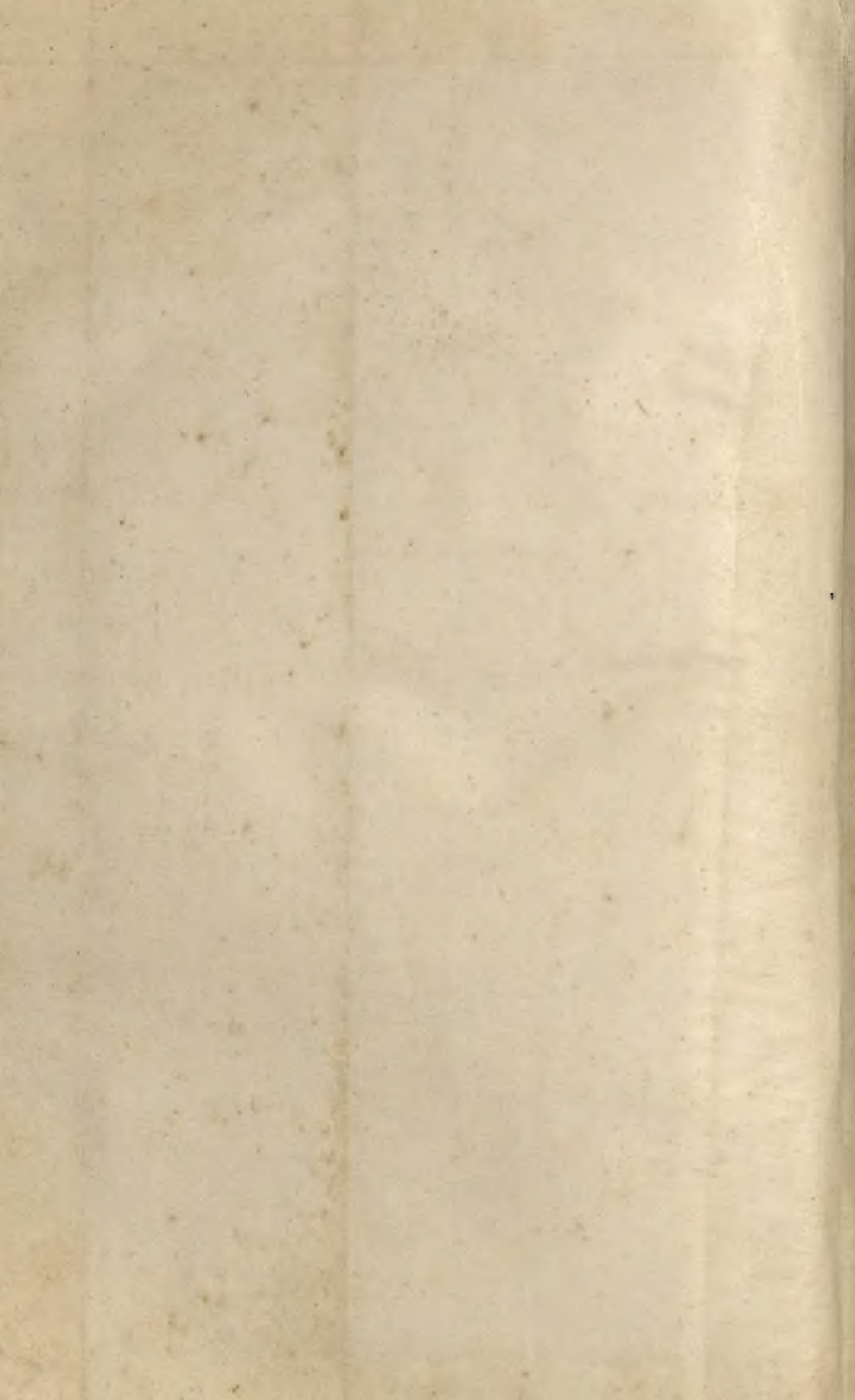
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